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On Structural Analogies in Nature and Art.

THAT the sculptor and art-student may feel the want of a guide to the proportions of the human form is avouched by the repeated attempts which have been made in ancient and modern times, and even by artists who themselves had the best claim to be independent of any assistance, to establish and supply it. A translation, with reproduced plates, of the "Polycletus" of the Prussian sculptor Schadow is the most recent recognition of this want; it is published by the authority of the Committee of Council on Education,—so we read on the title-page,—and "is intended more for the advanced art-student and draftsman (draughtsman) than for those who have not attained a certain proficiency in drawing the figure." Credit is taken for care to preserve very closely the character of the original lithographs, but we are warned not to regard them otherwise than as mere diagrams explanatory of the text. They are certainly not likely to be mistaken for anything more ambitious; the notice is only not superfluous because otherwise it would not be unreasonable to suppose, from the reputation of the sculptor who drew them, that he had naturally taken pains where pains would have been appropriately bestowed, and fancied that he had succeeded. As it is, the truth must be told, that whether we turn to examples of the average human figure, or to an Apollo or a Venus, the object which is presented to us in illustration of the laws of beauty is scarcely less repulsive and repugnant than those marvellous types with which Albrecht Dürer was satisfied for his treatise on human proportions. The Berlin of our own day would seem, if we are to trust these specimens, not more fortunate in its models of form than the Nuremberg of four centuries since.

Few who have given attention to that book of Dürer's will disagree with the brief verdict of Michelangelo thereon,—"poca e debole cosa questo libro." We are obliged to ask ourselves seriously how far the same may not apply to the "Polycletus" of Schadow. The very title-page provokes a challenge, and we ask, will sculptors and art students derive much guidance in the matter of proportion by "measurements in feet and inches of full-grown figures of both sexes and of various ages"? and, indeed, of figures not full-grown? for the measurements begin with the new-born infant "which can only be taken with accuracy when the nurse stretches out by force the arms and legs." It is only in the fourteenth double plate that we reach the full-grown example; earlier plates exhibit front, back, and profile measurements for years and half-years of progress up to seventeen. To an eye not unused to the scrutiny of living forms it is not pleasant to scan representations which the author may excuse as mere diagrams, but which on their own part evidently would be characteristic if they could, but cannot. We may fairly give credit to the measurements having been accurately made and recorded, but what interest they have very clearly does not belong to art, but to anthropometry. From the latter point of view, it may be of interest to record and classify the measurements of the entire population of a German town, man, woman, and child; but what an artist may be thankful for would be the measures of such select individuals as he recognises independently for beautiful or characteristic examples; for this recognition he does not want guidance, but he will welcome and be thankful for the discovery of any proportionate relations between dimensions or between masses which can be shown to conduce or be essential to the expressive result. It was a saying of Michelangelo that a sculptor should have his compasses in his eye; but this by no means amounts to the repudiation of the precision of measurements which proportion implies; he would have the perception by sight of proportionate magnitude so perfect that the application of compasses would not correct its report. It was only his mistrust, according to Condivi, of his literary faculty that withheld him from putting into form a better theory, matured between his anatomical studies and practice of art; it is unfortunate that the notes which Condivi made of his observations (*molte cose rare e recondite*), upon the body of a beautiful Moorish youth were never given to the world.

The explanation of these plates is preceded by a chapter headed,—"The History of the Science of Proportion"; but the substance of this is rather a bibliography arranged according to the nationality of the authors who have treated the subject. Even so it is necessarily incomplete, as the first edition of the Polycletus dates half a century back, and no note is given of even German writers,—Ziesing and others,—who have treated of the subject since. No attempt is made at definite summaries of the systems and principles of the different writers, nor are we supplied even with any general indication of what is most necessary,—the distinction between a truly scientific view of the subject and the many varieties of unscientific, with which the literature of it is encumbered. We can scarcely concede to the translator that Dr. Schadow himself has ably treated the science, though he claims only,—it is said "with the characteristic modesty of his erudite countrymen" (it is as well to remember that Schadow was writing in 1834),—only to have extended the researches of others,—and even so claims too much.

The treatment of the subject fails indeed of a scientific character above all in this respect, that the consideration of Proportion in the true sense,—the comparison of elements having definite functional relations by reference to definite ratios,—is deserted easily for a simple comparison of particular measurements. For the subject of the proportions of the human figure to be dealt with satisfactorily it is necessary, in the first instance, to acquire a distinct conception of what are the concrete phenomena of which we seek an explanation; what are the combinations of which we require the elements.

The concern of the artist is with expressive form,—with form that has a clear and definite characteristic expression,—whether of sublimity, of beauty, or of any subordinate modifications of such qualities, as even of prettiness or grotesqueness, and thence to well-marked varieties of the repulsive and the ugly. Now, to take the most familiar illustration possible, the heads of an Apollo, a Jupiter, and a Hercules all agree in essential features and their general arrangement, but special characteristic beauty is conferred by special proportions. When we extend our comparisons to the entire figure the same rule holds with limbs as with features. The beauty of each figure is a birth of the artist's poetic imagination. But if science presumes to meddle with the matter, we are entitled to demand of science an exposition of the contrasted governing principles which induce such contrasted results. Contrasted as two beautiful forms of a youthful Apollo and a youthful Hercules may be, they fall into direct comparison in two respects. The elementary limbs, members, features, are identical as such, in either form; and either form has a relation, but a relation of its own, to a common primary type; they may be regarded as diverging from this in different directions and degrees, but each at last presents itself as a strictly self-consistent and specific unity. The attainment of such well-defined specific character can only be accounted for on the assumption of the divergence from a common and primary type being subject to some regulative principle.

Such characteristic differences are matters, therefore, not of difference of parts but of relative dimensions of parts that in themselves are of the same nature; not of quality, but of quantity; not of what general kind of limbs, for instance, are combined in an organism, but

of what proportions are assigned to them severally, and on what principle.

The most important variations of specific character, then, it is clear, must depend upon modifications of the most important proportions, and it becomes a matter of leading interest to decide what are the seats of these, and what modifications they are susceptible of without being utterly lost and vitiated. We are just at present only concerning ourselves with the human figure, the highest of natural organisms, but have to bear in mind that if the principles which we arrive at are just, they must equally apply to characteristic variations of artistic types,—and notably of all the orders of Greek and all the styles of Gothic architecture. The determination of the proportions of the human body in a general way may be compared to that of the scheme of proportions among the notes of the diatonic scale; to have ascertained these would be a limited advantage indeed, but that it introduces us to the command of the re-arrangements which constitute the entire list of varied keys, both major and minor, with all their diversified characteristics in alternation and transition.

To deal with a human figure of an average type, we may say that when it is erect the total height is divided equally at the *symphysis pubis;* the upper half is then again equally subdivided at the line of the nipples, and the lower half just below the patella. But two of these lines of division at least have not exact structural or functional coincidence; and mere subdivision by what an ancient would call continued dichotomy, into a mere series of equalities, is essentially defective in power to express energetic consolidation. For proportional adjustment to fulfil its true office it must be applied to bringing into orderly relation those parts or functions which, in themselves, present the greatest contrast, and which therefore may seem liable to introduce confusion or fall into antagonism.

Here we have a problem for analysis, in the treatment of which we sometimes get our best clue from nature, and sometimes from perfected art. In a Greek portico we have no difficulty in recognising that the primary contrasts are between the comparative heights of the vertical and horizontal members in the first case, and then between the voids and solids,—that is, between the diameters of the columns and their interspacing. In the less developed stage of architectural art, but long after all the Doric members and details were decided, the principle of applying an exact proportional relation between the height of the column and the joint height of the horizontal members above and below them, seems to have been unrecognised. At the next stage, in cases when true proportionate exactness was applied, the column was at best allowed only half the height of the elevation; very frequently an effect of more than cumbrousness,—of clumsiness,—was the result of the height of the column being made the minor term in the comparison,—being made less than half the full height, however, in some precise proportion. To Athenian taste, study, and insight it appears to have been due at last that the architect recognised the superior, the animating effect, of assigning superiority of elevation to the column; and then not only of making this height precisely proportional to that of the horizontal members jointly, but adhering to a proportion of very low numbers, and to a proportion again of the simplest character, as having a difference between its terms of unity only. In the appendix to Mr. Cockerell's work on Ægina and Bassæ will be found an example. The height of the column of the latter temple compares with the joint height of stylobate, entablature, and pediment, in the ratio of 7 : 6. Here it is evident that we obtain a principle which may be stated in rigid terms, and yet is susceptible of varied characteristic application. These ratios, to which the geometricians have given the name of superparticular ratios, may be arranged in series, as their terms gradually approach to equality. The columns of the Theseum have the lighter proportion of 5 : 4, and those of the Parthenon the severer 10 : 9 (= the series $\frac{5}{7}\frac{6}{8}$, $\frac{8}{7}\frac{9}{9}$, $\frac{9}{7}\frac{3}{0}$).

We turn now again to the erect human form, and ask ourselves where would the Greek look for the leading contrast which demanded a primary proportional adjustment? What members or groups of members might he be expected to declare the exponents of a predominant antithesis, and to which of the terms selected would he assign a predominance between themselves? If we take upon ourselves to follow out the suggestive analogy supplied to us by the architect, we may find no difficulty in assuming that the massive trunk constitutes one term of a comparison with the joint height of the free lower limbs and the head and neck above, as the other. Accordingly it proves that the typical proportion, which we thus obtain, is 1 : 2, the simplest of all. That is to say, the massive body or trunk may be taken as exactly one-third of the height, the other two-thirds being divisible between the upper and lower completions of the full stature. This is a single, simple, and comprehensive proportion between terms which are naturally antithetical, and the natural effect and consequence of it is to convey an instinctive impression of unity, concert, combination, and breadth of effect.

As the lower extremities are equal to half the full height, there remains on this assumption one-sixth for head and neck, and it will be found by observation that the proportions which result have a satisfactory appearance both in art and nature; namely, head and neck, one-sixth; body, two-sixths; legs, three-sixths; equivalent to a proportion for the body of two-sixths to complement of full statue, four-sixths, or 1 : 2.

As we turned from architecture to Nature before, we may now in requital proceed in our comparison, by tracing how the hint obtained from Nature is applicable to architecture. "The perfection of proportion, as of many other things, was reached," says Fergusson, "in Westminster Abbey. Here the whole height of a bay is divided into two equal parts, and the upper subdivided into three, of which one is allotted to the triforium, and two to the clearstory." It will be observed that in this distribution, as in the typical human body, we have an exact division of height into halves, associated with a further subdivision of one half, resulting in a triple division, which followed the simple arithmetical series, 1 : 2 : 3. But the triforium, by its structural relation, groups preferentially with the arcade below, and the connexion is emphasised by continuousness of decoration; thus brought conspicuously together, they form a compound term of comparison with the height of the clearstory in the ratio 2 : 1, the height from the pavement to the string-course above the triforium being just double the height of the clearstory, which asserts its distinct and independent office above.

It is by no means as a matter of unlicensed fancifulness that again we recognise an analogous relation in the human figure. The test of this is to put to proof whether the point assigned as boundary of the divisions which are made terms of comparison, has or has not a natural propriety, to the full as positive and distinct as that which regulates the limit of the clearstory in the architectural examples.

When we contemplate the human form at the same time that we are possessed with a lively sense of its varied relations, the same distinction among them naturally declares itself, which is traceable as pervading the philosophical reflections of Prince Hamlet:—"Noble reason" and "infinite faculties" are correlative to "expressive and admirable form and movement,"—the action as of an angel, to apprehension as of a God. Even so, consciously or unconsciously, we are impressed by the correlation of what, with no meaning of disparagement, may be called the servile division of the body to the noble division. Even those who are least inclined to consider their bodies to be what they mean by themselves, will be apt to recognise a nearer relation of their intellectual, imaginative, and moral nature and functions, to the head and that upper portion of the trunk which houses the heart and lungs,—the organs most immediately concerned with and affected by sensation, thought, and emotion. There are vessels of honour and vessels comparatively of dishonour, and the organs which directly subserve animal growth, digestion, and locomotion, are on a different line of dignity to the immediate instruments of our highest endowments, from the organs of speech to the all-accomplished hands. The line which marks this division below the chest gives to the upper nobler division, as in the case of the Westminster clearstory, exactly half the height of the lower and subject or subordinate division of our marvellous frame. But, as Cicero is fond of interposing, *hactenus hæc*,—so much for this part of our subject. Still more definite application may follow.

REFORMS IN PLUMBING.

SOME members of the Plumbers' Company deserve to be congratulated on the effective Congress recently held at South Kensington,—the proceedings of which were reported at length in last week's *Builder*.* The company is not one of the great guilds;—it has no hall, and presumably its members are not stimulated so frequently as in some companies which have their palaces and use them royally. Plenty of work was, however, cut out for the members by the speakers and movers of resolutions. If what was asked of them is undertaken, all lead and solder of standard weight and quality will be sealed or marked; and as this was asked for by Scotch and Irish people in company with Londoners and visitors from country towns in voting for the resolution, that alone will prove a considerable task. They were also asked to consider whether the materials used in plumbers' work as substitutes for lead are suitable,—there being a very strong suspicion in the minds of some of the plumbers who were present that there was nothing like lead; and that iron pipes must fur up, have bad joints in themselves, and join other pipes awkwardly; that the best specimens of earthenware will have but a short life; and that zinc should have its character pronounced in an authoritative way. Still, if these claimants for notice made good their claims, then the company was requested to consider whether it would not be a good thing to fix standards of quality for those materials, and settle on marks by which the standards should be easily recognised.

When these tasks with reference to materials have been duly performed, the journeymen and master plumbers, their education, status, remuneration, and rewards, remain to be dealt with; and all these subjects with others allied to them,—and some a little wide of them,—were treated of at the Congress, in a number of short papers, and by plenty of speakers, before a large and appreciative audience. It is true that the order of things was not just as we, for the reader's convenience, have stated it. The materials were talked of nearly at the end; and the Congress had resolved without one dissentient at the beginning that plumbers ought to be properly paid. Observers have drawn very favourable conclusions from this fact. The resolutions seem to mean business, say these students of men and things, when the business element takes a decent prominence. If the members of the company, and the plumbers who are not members, had not been in force this practical appeal, they say, to sensibilities would not have been made. The "professional men, and men whose social position enables and entitles them to support the credit of the body and to advance its usefulness" (thus the worthy master commended his colleagues), who lend support to the mystery of plumbing would hardly have been so very much in earnest on this topic. The decision was put in these terms:—"It is desirable that in the future architects should not include plumbers' work in builders' contracts"; and the meaning of it was that general contractors are not fair to the plumbers,—that they pay them as little as possible for as much work as possible,—and that plumbers must either lose work, or work at too small profits, or do inferior work. Good general contractors, and many plumbers who

* See p. 553, *ante*.

work with and for them, would, no doubt, put a different complexion on some parts of the case; and the other sort of contractors need very slight consideration.

The system of lump-sum contracts by one contractor has taken pretty good hold, at least in the south,—and in the main good and honest work is produced under it,—in plumbing as in other trades. The effect of the clause against sub-letting in ordinary contracts is frequently misunderstood, or, at any rate, misrepresented. One common form is, "The contractor shall not sub-let or assign this contract, or any part thereof, without informing the architect and obtaining his written consent"; and then it is observed that, notwithstanding this, and without intimation or written consent, the architect will be well aware that a number of sub-contractors are at work on any large building. This looks like remissness, but is really judicious. The sub-contractors are not formally recognised unless they are inefficient,—then the contractor must employ them no longer. If they are underpaid, the feeling will be in the air, so to speak, and detected by a vigilant architect and a capable clerk of works without prompting. When the general contractor selects and employs other people, a better concert may be hoped for than where two equal powers,—or one that should, and another that wants to, rule,—are contending for precedence. It is difficult and often impossible for work to be carried on without little adjustments among the workpeople; the right men will not be available till next week; cannot something be done to make this suit? There are a dozen similar reasons, and others concerning employers besides, which lead people to look with favour on the system, even though they are unable to call it perfect. Still there is a case on the other side. The increased attention given to these matters by the more intelligent sections of the population will help the plumbers if they are reasonable and politic, as well as resolved. They may compel the world to make exceptions in their favour, and use their power so wisely when they get it as to make everybody confess that the change is an improvement.

The example of the Rochester (New York) master-plumbers was not quoted at the Congress, but it may supply a precedent for other people who have sufficient unity of purpose and resolution. Early in this year the leading people in the trade there,—about twenty employers,—resolved that they would, after the end of March, refuse to submit tenders for plumbing work, except directly to owners or architects. Their reasons were that "the practice of including plumbing and gasfitting work in builders' contracts has developed many evils. It has been a simple matter to foist upon the owner poor material and poorer labour,—the entire system of skin work,—and our trade has been branded as incompetent and dishonest. . . . . Some builders secure work with the estimate of one firm of plumbers, and then begin to play us off against each other, and thus cut down the price to be paid to the plumber who is actually employed to do the work; or they perhaps drop the plumber entirely, and buy the material and set a tinker to do the work." The stringent plumbing laws in some American towns, with such fines as 250 dols. for bad plumbing work in new buildings, and 150 dols. for putting vent-pipes which only pretended to be vent-pipes, and were worthy to be classed with wooden nutmegs or stage properties, may have rendered things possible there, for which the necessary education has probably not yet been gone through on this side of the Atlantic.

Perhaps there is still less preparedness here, for the institution of Provincial Boards of Examiners of Plumbing Work, consisting chiefly of trained working plumbers, all in connexion with the provincial schools of plumbing, and affiliated with a Metropolitan Board. The Board in a country town, it was maintained, should be invested with some local authority, hold a well-defined and acknowledged position, work in connexion with parochial authorities, and at the same time not usurp the duties of any of the municipal officers. Put forward as a little committee of trade experts, assisted by the knowledge and trained skill of professional architects, there might be a field for reports for small fees, and a good deal of useful work might be done in a quiet way. To carry out laws and regulations, and put in force compulsory powers, under Parliamentary authority, would be another thing, — requiring, indeed, something more than the education of the general population which would call for and favour such control. "Sanitary plumbers" have not yet proved, in any considerable number, that they could wisely be trusted with these powers,—that their superiority to fads and crotchets is so complete that their superiority to preferences for their own specialities and to dislike of other people's, is so evident that a self-respecting Sindbad should quietly allow such a weighty burden to seat itself upon his shoulders once for all.

Certificates to journeymen, who had proved their competency, was pointed to as one of the special duties which such Boards could well perform. Evey one must sympathise with a tradesman's preference for a workman who has come in at the front door, who has been admitted regularly, and been kept steadily in contact with actual work under an experienced master. It was decided that the apprenticeship system ought to be continued, —modified if necessary to suit the improvements in technical education. The old term of seven years some think too long,—keeping a young man from earning money for himself when he might well be doing so, if clever and well-taught. Five years was advocated as a more suitable time, perhaps from the fifteenth to the twentieth year; if finishing at nineteen there might be two years of probation added in other workshops. Strict apprenticeship for a sufficient time, and a scale of payment bearing some relation to the services of the apprentices to the master, will apparently be offered in times to come to the young plumber who wishes to qualify for being a useful servant of the public. Antecedents and character ought to go for a good deal,—for more than they always do now,—in securing employment; and the granting of a certificate which could be obtained by the right man, and which the wrong man could very rarely manage to secure, would be a step in the right direction. Such a testimonial to the serviceableness of a workman should be given for his qualities as a workman; for his skill of hand, trustworthiness, and so on. He should, of course, know the real purpose of the appliances which he spends his life in putting upon and into buildings, and his understanding of how to use them should obviously not be limited to the mere power of handling them in a good traditional way; nor, still more obviously, to merely correct knowledge of the theory. Perhaps in some of the speeches the value of knowledge, as an instrument for finding fault skilfully, was insisted upon too firmly. The working plumber, it was argued, ought to know whether work would fail if carried out in the manner directed; and one speaker went the length of stating that he should be able to refuse to work, when he thought he knew better than the people who were setting him to do it.

There is always a trifle too much fun made of the ignorant architect when drainage, soil-pipes, traps, and water-closets are being talked about. The architect,—that is, putting all the profession together and writing of it as an individual, several thousand single gentlemen rolled into one,—knows quite as much about those matters which are within his province, as the individual comprising (by the same figure) any other profession or trade, knows about the province under his professional or tradesman-like care. We are, it may be, inclined to show some sensitiveness on this point, when taking no notice might seem more politic; but the time must come for making it clear that a bad joke is not improved by endless repetition. However, at a Congress there is a happy tendency towards throwing blame on the absent, as well as on those whom it is difficult to honour. *Apropos* of the registration of journeymen, it was pleasantly suggested that if masters were registered it might have the effect of keeping linen-drapers and others from undertaking plumbing work; and, stung probably at the recollection of specialist assumptions, another speaker blurted out his complaint that "the honest plumber was too often put on one side, and any one who could write on sanitary science came to the front." This sort of thing may be useful, but Mr. Bultitude had actually to change his identity before he profited duly by this kind of discipline.

The congress was certainly an interesting one; and will prove more so in looking back, if the recommendations are carried out to practical results. We hinted above that the Plumbers' Company will have its hands full; but hope it will make haste slowly, and manage to go bravely to and through all the workings;—that it will take the leadership, and get plumbers to do the best of work when it it is required of them, to train themselves very thoroughly, to look after their apprentices, and find good workmen constant employment, and that somebody will at the same time be taking pains to make it clear that the materials are as good as the work upon them.

NOTES.

AT a special meeting of the Court of Common Council last Tuesday, at the Guildhall, to discuss a report of the Bridge House Estates Committee in relation to the erection of a low-level bridge over the Thames, from Irongate Stairs to Horselydown, it was unanimously resolved to adopt the report. The recommendation of the Committee was for a bascule or lifting bridge, rather than a swing-bridge, in which we entirely concur; of the two it is likely to be the more manageable, though probably the more expensive at the outset. (The estimated cost is 750,000*l.*) There will be only two piers, occupying together 80 ft. of the waterway, leaving a clear passage of 200 ft. We shall watch the result, if powers are obtained for it, with the greatest interest, but the statements on the subject at present are too *couleur de rose*. It has been asserted, for instance, that the average time occupied in the passing of vessels will be only about three minutes, and that in regard to the average number of vessels passing this will not involve the stoppage of the bridge traffic for much more than an hour during the day. We feel certain that the average time from the raising to the lowering of the bridge will prove to be more than that, especially when it is remembered that, taking into account the swiftness of the tide current in the Thames, a very large margin will have to be allowed for an approaching ship, to insure perfect safety. Then the stoppage of a bridge for a number of short intervals, amounting in the aggregate to an hour, is a very different thing from its stoppage for one hour at a specified time. The latter could be reckoned on in the traffic arrangements, the former cannot. We are glad to see that our often-repeated recommendation to try well-appointed ferries for intercommunication is to be acted upon, and the Board of Works will go to Parliament for powers to establish such ferries, free of toll, between North and South Woolwich, and between Greenwich Pier and Barque-street, Poplar.

IN one of the roughly-fenced inclosures in front of the South Kensington Museum there are now lying the *disjecta membra* of a very interesting work of modern art, which on every account deserves very different treatment. These are the ponderous carved stones of a gateway executed in the Hindoo style by modern Hindoo workmen for the recent Calcutta Exhibition, at the cost of the Maharajah Scindia of Gwalior, and subsequently sent over by him as a gift to the South Kensington Museum. The idea of encouraging modern native workmen to execute a work in emulation of their ancestors originated, we believe, with Major J. B. Keith, who was commissioned by Sir Lepel Griffin to look after the work. Having been engaged in the work of conserving the ancient monuments of Central

India, it occurred to Major Keith to give the work a practical significance, as showing that the descendants of those who had executed the massive carved gateways of the Gwalior district retained something of the same cunning. The native art-workmen threw themselves into the work with enthusiasm, and executed it in the space of six months, a very short period, considering the massive character and the elaboration of the work. The arch (so-called) alone is a solid piece of eight tons weight, the spandrels and jambs being covered with delicate carving. Well, this piece of work, executed by the men of our great Indian dependency as an example of their skill, presented to our national museum by an Indian dignitary, has been for some months lying, in pieces swathed in haybands, in a back-yard, as one may say, of the South Kensington Museum. The arch-shaped doorhead is set up to see how it looks, apparently, and it seems that a considerable number of the bud-like pendants of the soffit have been knocked off in transit. The jamb-columns and capitals are uncovered, lying on the ground, and show beautiful workmanship. The whole thing would be of the highest interest, and it is left lying on the ground, like another Burlington colonnade business, because the authorities cannot make up their minds where to put it. Is this creditable?

AS our readers must be aware, we never meddle with party politics, not wholly from want of interest in the subject (though it seems to tend just at present more and more to a paltry game of "beggar my neighbour,") but because it is out of the proper scope of this journal. Architecture is of no politics. But in the interests of public order we must say that the attitude taken by the Home Secretary on the opening night of the session, in regard to the complaints of Members who were impeded in their passage to the House by the great anti-House-of-Lords procession, was most unsatisfactory, not to say absurd. If it is a standing sessional order that "the Commissioners of Police do take care that during the sitting of Parliament the passages through the streets leading to this House be kept free and open, and that no obstruction be permitted to the passage of Members," it is the simple duty of the authorities in power at the time to see that this provision be carried out. One honourable Member, who, it may be admitted, is rather prone to make the most of things, declared positively that he could not have got to the House but that his club enjoyed the special convenience of a subterranean passage thereto; and the leader of the Opposition, who is certainly not given to inordinate grumbling, stated that on entering a cab at Waterloo Station to drive to the House, he was forbidden to cross Westminster Bridge (which, in fact, he would have found impassable on that day,—*expertis credite*),—and was told to go round by Lambeth Bridge. If this is not "obstructing the passage of Members to the House," what is it? It is against all common sense for the Home Secretary to pretend that he has not power, or that it is an injudicious interference, to forbid to a popular procession a route the use of which must involve the abrogation of one of the very orders which it is his own official duty to see carried out. We make the comment without prejudice, seeing that our politics, if we had any, would not be those of Sir Stafford Northcote and Mr. Chaplin. But this is a question not of politics, but of police; and we hold that the objectors were perfectly right, and that such an obstruction ought not to be allowed to become a precedent.

THE recent meeting in the City in favour of a code of arbitration law was a practical attempt to assist the passing of a useful measure. Perhaps of all the branches of municipal law there is none of greater interest to those who are connected with building matters than that which is concerned with the law of arbitration. It will be very satisfactory if a plain and clear digest of this subject can be published. But we should be sorry to see any regular Court of Arbitration grow up. The law courts are in themselves one kind of courts of arbitration, and what are popularly termed arbitrations are only required when the matter to be inquired into is full of so much detail that it is not possible to enter into it in a court of law. It is also quite a mistake, as many of our readers are well aware, to suppose that arbitrations are really cheaper than actions. The expenses of witnesses, of preparations for the encounter, of arbitrators, have all to be incurred. The cheaper the law is the more useful it is to the community at large, but we entirely deprecate setting up courts of arbitration side by side with the law courts. But this objection in no way prevents us from expressing a desire to see a code of arbitration law speedily in the Statute Book for the use of all those who may have to give their attention to this subject.

MR. RUSKIN'S Oxford lectures on the various pleasures of England, though they were announced as art lectures, seem to turn mainly on what may be termed moral lessons derived from history. The second one, delivered on Saturday last, on "The Pleasures of Faith," and embracing the period from Alfred to the Confessor, was, in fact, a religious exhortation for the most part, and as such in many points most stirring and admirable; but into that side of his subject we do not here profess to follow Mr. Ruskin. There were one or two bright gleams of light thrown on the artistic side of the subject, however, as when the lecturer appealed to the coinage of Alfred as part of evidence of what London was like in the ages of faith. The character of a coinage, he urges, is quite conclusive in national history; there is no great empire but tells its story in beautiful coins. True, as far as it goes, no doubt; but it hardly goes quite so far as Mr. Ruskin makes out. Then there were the Saxon war-ships "bright with banner and shield and dragon prow," lying at London's strand, more beautiful, it is implied, than anything to be seen there now. We should like to draw Mr. Ruskin's attention, by way of looking at the other side, to the enthusiastic and picturesque meditation on the London docks and shipping by Mr. Richard Jefferies, which appeared some time ago in the *Pall Mall Gazette*, and part of which we reprinted and commented on at the time.*

THE exhibition of the Turners' Company at the Guildhall, though it includes a good deal of very neat and some very finished workmanship, does not seem to have satisfied the judges, who have declined to award the highest prizes because the combination of high finish with excellence was not found in any article submitted in the competition; though, as the number of exhibits was 121 and the number of prizes of some kind awarded is 44, the minor guerdons seem to have been distributed with a tolerably liberal hand. The exhibits were classed under three heads: wood, pottery, and the cutting of precious stones; the subject of turning including mechanical manipulation of various descriptions. Now, in regard to the artistic side of the matter we must say that the exhibition confirms what we have always felt and occasionally said,—that turning does not seem to be a branch of work which by any means tends towards artistic development. Neatness, cleverness, what may be called sleight of hand, it promotes no doubt; but there seems to be something in the very nature of lathe operation which deadens the artistic sense. Nearly all the more elaborate exhibits in wood show indifference to, or want of feeling for, pure beauty and expressiveness of form; the outlines are essentially mechanical; the object is to execute little *tours de force* in minute turned ornaments stuck on over the larger turnings, &c. The only things that have some of the salt of art about them are some of the larger plain, but freely-shaped, pottery exhibits, with their fine flowing lines. The eye for form seems to be cultivated by these; by wood-turning it seems only to be deteriorated; the wood will not take the fine flowing sweep of the clay, and the result is "a thing of shreds and patches," the exhibition of ingenuity rather than art.

* "The Picturesque of To-day," *Builder*, Nov. 10, 1883.

AT the General Meeting of the Egypt Exploration Fund on Wednesday last, Mr. Flinders Petrie gave an interesting description of the excavations he has been recently conducting at the Temple of San, which he illustrated by a large series of photographs shown by limelight. The great area of the temple presents the appearance of a long disused quarry, which, in a sense, indeed, it may be said to be, though no stone was naturally there craggy-looking masses of granite, parts of broken obelisks, colossi, and columns with their lintels lie scattered on the ground, a few stones of a distant pylon alone being left one upon another. Mr. Petrie has cleared away the accumulated rubbish and sand from the remains, exposing some fine carvings and hieroglyphs, but, beyond an interesting shrine of limestone, a very fine colossal head of Rameses II. when young, and some few exceptional treatments of the sculptured figure, there is little to be seen at present that throws fresh light on the art of ancient Egypt. But who shall say what treasures for the archæologist may lie hidden under that *débris* of ages which cover the wide and unexplored ground yet to be worked? Mr. Petrie proposes to return to Egypt next year to resume his works outside the wall of the Temple.

THE Council of the Institution of Civil Engineers have forwarded us the list of subjects on which they invite original communications, for the best of which various premiums, arising from funds bequeathed for the purpose, will be awarded. The list is large and various, including forty-three different subjects. Among those which bear more or less upon our own class of subjects may be mentioned:—

"Improved Instruments for Surveying and Levelling."

"Machines and Measuring-Apparatus for Testing Metals, and the Equipment generally of Mechanical Laboratories."

"The Mechanical Properties of Cold-Rolled Metal, as compared with Hot-Rolled Metal, and on the Cold-Rolling of Iron Shafting, as practised in America."

"The Manufacture, Strength, and other Properties of Castings of Malleable Cast Iron and Cast Steel."

"The various systems of Brickmaking by Machinery."

"The Principles involved in the Conservation or Improvement of any Tidal River or Estuary."

"Promenade and other Piers, with reference to the effect of Sea-water on Wrought and Cast Iron Structures, and the best Means of Preserving the same."

"The Ventilation of Sewers, with a Summary of Experiments as to the Motion, Pressure, &c., of Gas in Sewers."

"Filter Presses for separate Fluid in Semi-fluids, particularly for the treatment of Sewage Sludge."

"The Transmission and Distribution of Electricity over large areas for Lighting and for Motive Power."

MR. ROBERT L. STEVENSON, a member of a family honourably known in the annals of the civil engineers of Great Britain, justly complains, in the columns of a contemporary, of the ascription, in a popular publication, of his grandfather's noble work, the Bell Rock Lighthouse, to Rennie. That distinguished engineer would have been the last person to claim either the design or the execution of the sea tower in question. Not only have the Stevensons reared, it may be almost said with their own hands, some of the grandest and most serviceable monuments that stud the stormy shores of our island, but they have further served their profession by the literary memorials they have put on record, such as the "Life of Robert Stevenson," by David Stevenson, published in 1878, which gives a full and most interesting account of the building of the Bell Rock Lighthouse. It is disheartening to find achievements of this nature, when referred to in popular literature, so imperfectly treated, that the author cites a second-hand reference to part of a newspaper correspondence as what he calls "authority" for very grave mis-statement. Mr. Stevenson has done well to protest.

A SUGGESTION made by Mr. Nicholas Whitley, C.E., for utilising the water power of the Nile for the purpose of forcing a supply, through a 12-in. pipe, from the Fifth Cataract to Suakin, deserves more than a moment's glance. Under reserve as to the resistance afforded by the friction of 240 miles of 12-in. pipe, and by the height to be overcome between the Nile and the Red Sea (which we leave to the responsibility of Mr. Whitley), the main difficulty involved would appear to us to lie in the guarding of the line. The height of the water in the Nile at the junction of the Atbara is given by Mr. Baker as 1,148 ft. above the Mediterranean; and the force of the cataract, or rapid, could probably be easily applied by a turbine or turbines. The quantity of water to be derived, which is an important consideration, would not be such as to raise serious objections. On the whole, it would be well to see Mr. Whitley's proposal put into the form of definite hydraulic computation.

WE are glad to observe that at a meeting of the General Purposes Committee of the Manchester Town Council at the end of last week, notice was given of a motion in opposition to the resolution of the town's meeting some little time previously in favour of making a grant out of the city rates in aid of Parliamentary expenses. Mr. Alderman King said it was unfortunate that many of the ratepayers had not been afforded the opportunity of expressing their objection to the resolution at a poll of citizens. We commented at the time on the very undesirable precedent that would be set if such a use of rating powers were sanctioned.

THE completion of the new Turkish baths in Northumberland-avenue, planned and designed by Mr. R. Walker for Messrs. Nevill, the proprietors of the London Bridge and Aldgate Turkish Baths, has been one of the architectural events of the week. The building includes baths both for men and women, the entrance to the former being from Northumberland-avenue, that to the latter from the other end of the building next Craven-street. The interior arrangements and fittings are carried out in a very complete manner, and the general effect of the rooms is pleasing. The actual baths are in the basement, and the interior includes a large central hall or divan, with a gallery running round it. We reserve further details till we can accompany them with an illustration.

AT the meeting of the St. Paul's Ecclesiological Society, on Tuesday last, Mr. Hugh Stannus delivered a lecture on the decoration of the dome of St. Paul's, describing, in a very clear and lucid manner, the principles of treatment which he regarded as correct, including the "articulation" of the dome design with the architectural substructure. Mr. J. P. Seddon occupied the chair; and a short discussion followed, in which Mr. Micklethwaite, Mr. G. H. Birch, and Mr. Statham took part. Mr. Micklethwaite urged, in a very practical spirit, the desirability of first settling the future arrangement of the cathedral for worship, and its complete furniture (in the widest sense) for that purpose, before deciding on the treatment of the culminating point in the decoration. Mr. Statham differed from Mr. Stannus in recommending a rib treatment of the dome in eight partitions; such a treatment being rather suited to an octagon dome, such as that at Florence, and being, in fact, a contradiction of the actual architectural structure of a hemispherical dome, and tending to weaken its effect of space and mystery, and reduce the dome from poetry to prose. He certainly did not, however, as Mr. Stannus in his reply seemed to think, recommend what may be called "Corregiosity" in dome decoration, but only the homogeneous treatment of the spherical surface in a purely decorative manner. Mr. Seddon summed up, if we understood him rightly, rather in favour of this latter view. Mr. Stannus has gained an honourable position in relation to the experimental decoration of St. Paul's by the energy and ability which he has brought to bear upon it; but we may suggest that he should not refer to Mr. Poynter as his "colleague" in the matter,—a phrase which hardly represents the true state of the case.

THE *Pall Mall Gazette* published on the 28th five small and rough outline illustrations of the designs submitted for equestrian statues for Blackfriars Bridge, submitted in the second competition by Messrs. C. B. Birch, Hamo Thornycroft, T. Brock, and R. Belt ("Que diable faisait-*il* dans cette galère?"). It is difficult to judge at all of the merit of the works from these rude illustrations; one or two of the statues look as if they might turn out something. The *Pall Mall* sets out, we observe, with the statement that Blackfriars Bridge "is without doubt the handsomest structure of its kind in London." It is, without doubt, the most tawdry, pretentious, and vulgarly-designed bridge ever put over the Thames; but that is the kind of thing which is usually called "handsome" in amateur architectural criticism. What must be the architectural perceptions of a critic who can look on such a piece of claptrap as Blackfriars Bridge, and on Rennie's grand work a little lower down the river (not to speak of Waterloo, which has great merits), and then deliberately characterise the first-named as "the handsomest" of our bridges? We quite agree with the *Pall Mall* that the competition has been much mismanaged, and that the sculptors ought at least to be remunerated for their labour (for it seems nothing is to be resolved upon even now), but for the rest we wish our contemporary "all manner of prosperity, with a little more taste."

PUBLIC HYDRAULIC POWER.

SCHEMES having for their object the distribution of motive power to the public have been frequently brought forward, but, with the exception of the work we are about to describe, no practical results have followed, so far as the metropolis is concerned; unless the introduction of the gas engine may be said to have constituted the gas companies distributors of a source of motive power. A year or two ago a system was in operation in New York by which steam was generated in large central establishments, and carried underground through suitable mains, to be supplied to the public in the same way that gas and water are ordinarily laid on. The scheme, however, was a failure, and we understand that the company which promoted it has suspended operations. In England power is now being supplied by means of hydraulic pressure, the town of Hull having had such a system in operation for the last nine years.

Within the past twelve months the General Hydraulic Power Company (Limited) has been engaged in carrying out an extensive system of power distribution which has been elaborated by Messrs. Ellington & Woodall, MM. Inst. C.E., of Palace-chambers, Westminster, who are engineers to the company. The work already done, and the success attained, appears to leave little doubt that the system will become a leading feature in the metropolis, even if it does not spread to other large towns. London, however, offers an especially favourable field for an enterprise of this nature, inasmuch as it is the great depôt of the nation. Hydraulic power is especially well adapted for the production of rectilinear rather than rotary motion, and the numberless cranes and hoists of various kinds used in the metropolis for the transshipment and warehousing of goods require just such a motion as water pressure is best adapted to give. In addition to this, the great value of land in London renders it always desirable to economise space as much as possible, so that the room occupied by an engine and boiler is generally an object of considerable importance. The higher rate of wages in London is another feature that tends to the same end, the ordinary attendance and necessary repairs to machinery costing far more in the metropolis than in any other part of the kingdom.

From an engineering point of view, there is not a great deal that is new in the operations now being carried on, if we put on one side their magnitude, and the distances through which the power is conveyed. In most docks, and in the large goods depôts of different railway companies, hydraulic systems identical in principle have been in operation for so long that the venture of the present company is no experiment so far as engineering practice is concerned. The only point that had to be solved was whether the public would give sufficient support to the scheme to make it financially a success, and although it has not been in operation for a twelvemonth, the promoters consider that an affirmative answer has already been given.

The central pumping station of the company is situated at Falcon Wharf, close to the Blackfriars Station of the London, Chatham, and Dover Railway Company. The water required for the service is taken from the river below ordinary low-water mark. The intake consists of a 10-in. pipe, which has large stones placed over the inlet so as to keep out as much mud as possible. On the wharf there is one of the Pulsometer Company's No. 9 Pulsometers, and in the engine-house are two of Brotherhood's centrifugal pumping engines. These are used for lifting the water from the river to tanks placed on the top of the engine-house. There are three tanks, or, rather, one large tank is divided into three divisions. The total size of this three-fold tank is 44 ft. 3 in. by 49 ft. 6 in. by 4 ft. deep. It is composed of cast-iron plates bolted together, the joints being planed to surface. Into one of the compartments the water from the river is lifted, and is there allowed to settle for a time so as to get rid of the heavier particles of matter held in suspension, after which it is run into two double "Thames" filters by the Pulsometer Engineering Company, which are placed in the engine-house below, and which are calculated to pass 5,000 gallons per hour each. This description of filter consists of a cast-iron cylinder lined with copper. In this are two pistons composed of opened gratings covered with wire gauze.* The piston-rod, which is cased with gun-metal, passes through a suitable stuffing-box in the cylinder cover, and is attached above to a small hydraulic ram, by means of which the necessary motion is given to the pistons. Above each of the latter is a perforated diaphragm, and the space that lies between is filled with sponge, which forms the filtering medium. The water to be filtered flows by gravity from the tanks above, and rises through the mass of sponge, by which matters held in suspension are retained. So far the action is very similar to that of an ordinary filter, but it is in the cleansing arrangement that the novelty lies. When it is required to clear the filter the pistons are caused to move up and down by the hydraulic power. This action alternately compresses the sponge and releases it from pressure. The current of water is at the same time reversed, so that clean water flows downwards through the mass of sponge. The operation effectually cleanses the sponge, the working it receives from the pistons acting in the same way as the hand-squeezing one usually gives a domestic sponge when it is necessary to free it from any foreign matter. By this ingenious arrangement the great difficulty that has hitherto been experienced in large filters,—that of cleaning them,—has been satisfactorily overcome. From the filters the water rises to another series of tanks which are placed over the boiler-house. These are at a lower level than the first set, so that no further pumping is required. The combined length of the latter tanks is 66 ft. They are 29 ft. 6 in. wide and 4 ft. deep. In one corner is a charcoal filter-bed 14 ft. 9 in. long by 12 ft. 6 in. wide, through which the water first flows.

Arrangements have been made for doubling the tank capacity by erecting another tier above those tanks now in position, and it appears likely that this increase will soon be required. The first three months of this year three and a quarter million gallons of water were raised; last quarter the quantity registered was five and a quarter million gallons, and that the rate of increase will be more than maintained for some time is, we believe, insured by the installations already asked for. The company is empowered by its Act to take from the river one million gallons a day. This would be equal to a power of 800 horses continuously supplied for ten hours, but as the demand is always intermittent the capacity is estimated at from 2,000 to 3,000 horse-power. From the tanks last referred to the water is taken by the main pumps, of which

* In the ordinary single filters there would be only one piston.

there are two sets already at work, and which have been supplied by the Hydraulic Engineering Company of Chester. Another set similar to those now in operation are ready for erection, and will be under steam before long. These latter are the pumping-engines we made reference to in our recent notice of the meeting of the Iron and Steel Institute at Chester when describing the works of the Hydraulic Engineering Company (see p. 451, *ante*). The foundations are also laid for a fourth set of engines, and there is room for two more sets in the building. These, it is anticipated, will be soon wanted. The engines are of the inverted compound condensing type, and are supported on wrought-iron standards, the condenser also forming part of the framing. They have three cylinders, one high-pressure, 19 in. in diameter, which supplies steam to the two low-pressure cylinders, which are each 25 in. in diameter. The stroke is 2 ft. The Correy type of valve-gear is used. In this the expansion valve is forced down by the pressure of steam in the valve-chest acting on the valve-rods, which are made of large section for the purpose. The valve is released at the right moment by trigger gear, which is actuated by a cam. By shifting the cam the cut-off can be arranged for any desirable part of the stroke, and a very sudden closure of the part is also obtained. The stopping and starting of the engines is automatically performed by means of a governor and an attachment made to the accumulators, so that as water is drawn away in the course of work the pumps are immediately started to make up the deficiency. The pumps are 5 in. in diameter, and the plungers are driven directly from the steam pistons, there being forked connecting-rods for driving the crank-shaft. The two engines now at work will give an aggregate of about 300 to 320 indicated horse-power, and will each deliver 240 gallons per minute with the accumulator at a pressure of 800 lb. per square inch when using steam at 80 lb. pressure.

There are three steel boilers of the Lancashire type, each 28 ft. long and 7 ft. in diameter. They are fitted with Green's economisers, which consist of a series of vertical tubes placed in the flues in the path of the escaping gases. Through these the feed-water flows, and its temperature is raised by the waste heat. The great difficulty in the application of all feed-water heaters has been to keep the soot and tarry products from depositing on the cold pipes. In the present instance this is got over by having fitted to each pipe an annular scraper, which is worked automatically from the outside. The economiser is said to give very good results in the present instance. The stoking is carried on by means of a mechanical stoker by Messrs. T. & T. Vickers, of Newton-le-Willows. The fuel, which consists of breeze, the small refuse coke from gasworks, is fed into hoppers, and is automatically and continuously charged into the furnace, where it is constantly carried on towards the back end of the fire-bars, by a reciprocating motion which is given to the latter. The clinker is broken up at the same time and is removed by hand. The good results obtained in these boilers with such a poor fuel as breeze would seem to indicate that these mechanical stokers are also a success. The trunk mains are of hydraulic pipe, 6 in. in diameter. They are in 9 ft. lengths, and are tested to 2,500 lb. per square inch at the works. The joints are formed by spigots and sockets, turned and bored. They are packed with india-rubber washers, and held by two 1¼ in. bolts passing through oval flanges. At intervals of from 400 to 500 yards there are stop-valves, which can be used in case of damage to the pipes, or for the purpose of localising a leak in the system. In most cases each main can be fed from either end, so that an accident in any one spot would only shut off the length of 400 or 500 yards between the two nearest stop-valves.

The area over which the company is empowered by the Act of Parliament to lay their pipes extends on the south side of the Thames from the Surrey Commercial Docks to Vauxhall Bridge, and goes back a distance of 600 yards from the river bank for the whole length on the Middlesex side; the district comprises all land that lies between the West India Docks and Vauxhall Bridge, within a distance of 1,200 yards from the river. Several miles of mains have already been laid, and these are being added to as fast as the work can be done. On the north side two large mains pass down Cannon-street and Upper and Lower Thames-street respectively. On the south side the pressure has been carried east as far as Crucifix-lane. The quantity of water used is ascertained by a meter, and the consumers are charged, at the registered rates, only for the amount consumed. The following is the scale of charges:—

		Per Quarter.
Under 3,000 gallons		£1 5 0 per machine.
Above 3,000 ,, not exceeding 5,000 gallons		0 8 0 per 1,000 gallons.
,, 5,000 ,, ,, 10,000 ,,		0 7 0 ,, ,,
,, 10,000 ,, ,, 20,000 ,,		0 6 0 ,, ,,
,, 20,000 ,, ,, 50,000 ,,		0 5 0 ,, ,,
,, 50,000 ,, ,, 100,000 ,,		0 4 0 ,, ,,
,, 100,000 ,, ,, 200,000 ,,		0 3 0 ,, ,,
,, 200,000 by special terms.		

There is a charge of 5s. per quarter for meter. We understand that at the highest rate the cost for power is less than half that charged by the water companies for an amount of water at the company's pressure capable of doing similar work. In many cases the cost of lifting by the Hydraulic Company's power is as low as ½d. per 50 foot-tons.

The many uses to which the hydraulic power may be put will readily suggest themselves; we will, however, give a few details of some of the principal installations that we have lately met with. The first we will mention is that at the Lead Works of Messrs. Grey & Marten, which adjoin Southwark Bridge. Here the original motive power machinery has been entirely done away with, and that from the Hydraulic Company's main only is taken. The presses for producing solid-drawn lead pipe are one of the principal features in the plant. A water pressure of about 5,000 lb. per square inch is required for working these, and, as the Hydraulic Company's pressure is not much above 700 lb., a machine, known as an intensifier, is used. This consists of a double ram, the two areas not being the same. The pressure from the main is admitted beneath the larger ram, and in this way a considerably higher pressure can be obtained upon the smaller one, the final pressure being proportional to the difference in areas. At the large grain warehouses of Mr. George Doo, situated at St. Mary Overy's Wharf, near London-bridge, the Hydraulic Company's power is extensively used. Here there are several cranes, elevators, and conveyors, all especially designed for handling grain in bulk. With these appliances and by the aid of a Priestman's bucket, it is astonishing how quickly a barge-load of wheat or maize is transferred from the craft to the warehouse floor. The cranes are on the double-power principle, so that with light loads there is a smaller quantity of water required. There is also a hydraulic pump used for draining the basement. The whole of the work here is of considerable interest, and has been executed by the Hydraulic Engineering Company, Limited, of Chester.

On the north side of the river the most instructive application of the system is that which is to be found in the large block of new warehouses in Wood-street. These buildings have been erected in the place of those destroyed by the memorable fire of December the 8th, 1882. In Messrs. Foster, Porter, & Co.'s really gigantic establishment the whole of the lifting and transporting of goods is carried on by power supplied by the Hydraulic Company. Here there are several cranes, together with lifts and elevators of many varieties, including those for goods, passengers, coals, &c. There is a separate lift used for carrying books from the counting-house to the various floors, and another working in connexion with the kitchen. In the same block of buildings Messrs. Silber & Fleming, and Messrs. Rylands & Sons, Limited, are also using the power of the company for handling their goods. In this densely crowded neighbourhood the conveniences of having a source of power always available without requiring thought or trouble are very highly appreciated. Carts are quickly unloaded, and the traffic in the narrow tortuous streets is much relieved. But in the particular instances we have under consideration, no doubt there were even stronger inducements to adopt the system. Putting aside the actual loss arising from a great fire in merchandise and buildings, which can be covered by insurance, the damage done to a business by being thrown into a state of utter confusion is a most serious matter, and has been keenly felt in the instances in question. In addition to removing a source of danger by doing away with the necessity of steam boilers on the premises, the application of the hydraulic power enables powerful hydrants to be placed in any required position where the hydraulic service is laid on. It is well known that, in a jet of water used for fire extinguishing, force of impact is almost as desirable as volume. By the use of the injector hydrant, which was designed by Messrs. Greathead & Martindale, and is being manufactured by Messrs. Sir W. G. Armstrong, Mitchell, & Co., both volume and impact can be obtained. In this apparatus a small jet of water from the high-pressure service is injected through a nozzle into a chamber through which flows a larger volume of water obtained from the water companies' mains, or from any other convenient source. By the lateral inductive action of the high-pressure water, the slowly-moving stream has the required velocity imparted to it, and the whole is forced through a nozzle in the ordinary way. It has been found by experiment that with a high-pressure service of 700 lb. to the square inch, which is that carried in the Hydraulic Power Company's pipes, and a low pressure service of 20 lb. per square inch, it will require 32·4 gallons of high-pressure water to throw a jet of 150 gallons per minute through an inch nozzle, and to a height of from 75 ft. to 84 ft. This would be equivalent to the pressure due to 100 ft. head at the back of the nozzle. The hose is taken to be 200 ft. long and is the ordinary 2½ in. brigade hose, the resistance of which may be considered as equivalent to 3 in. head per foot of hose. With pressures in the Water Company's mains of 60, 50, 40, and 30 lb. to the square inch, 3·7, 10·9, 18·1, and 25·2 gallons of high-pressure (700 lb.) water would be required respectively, the remaining conditions being as before stated. The difficulties attendant on fire extinguishing, as at present carried out, are constantly receiving too many practical and melancholy proofs to require urging here; the superiority of fixed hydrants, always on the spot and at any time ready for immediate service, over an engine that has to be brought from a distance, and may possibly be engaged elsewhere, is apparent; supposing, of course, the hydrants are sufficiently powerful for the work required from them. We, in London, have never yet had to deal with two fires of great magnitude at one time, although we have more than once been very near having to do so. It taxes all the resources of our present fire brigade to limit the ravages of a conflagration such as that of last December twelvemonth, to the confines of one block of buildings; the result of two such fires occurring on a breezy night might be little short of the disasters of Chicago or Boston.

There is a further point worth noticing in connexion with the Wood-street installation. The warehouses last referred to were outside the Parliamentary limit of the company at the time these pipes were laid down, and the local authorities had, therefore, to be petitioned before the streets could be opened up. In spite of the very great inconvenience that is inflicted on the owners of warehouses in this overcrowded part by the stoppage of a thoroughfare, nearly the whole of them signed the petition in question,—a fact which speaks strongly of the estimation in which the Hydraulic Company's labours are held.

The company has a pumping-station in Philip-lane. Here there are two 20-h.p. locomotive boilers by Robey & Co., and two pumping engines by the Hydraulic Engineering Company, of Chester, with 8-in. cylinders and 12 in. stroke. The accumulator is 18 in. diameter by 20 ft. stroke. It has not been found necessary yet to have recourse to this machinery, as the engines at Falcon Wharf have been found sufficient for the purpose. In this case the source of power is nearly two miles, in the line of the mains, from where it is used, but we understand that there is no appreciable loss of power or unsteadiness in working. This is no more than might be expected, for the loss in transit is less than is generally supposed. Sir Frederick Bramwell has put on record that power can be conveyed through pipes of small diameter at a speed of

one foot per second with a loss of only 2 per cent. per mile. The actual experience in the present case will, however, be of value in convincing those who doubted the practicability of conveying power at high pressure for public use through long distances.

THE WORK OF THE ARCHITECTURAL ASSOCIATION.*

THOSE who were present on the corresponding night to this last session will, perhaps, remember that we considered the various statistics furnished us by the Brown Book, which, *en passant*, I rejoice to see has returned to its true colour this session. These statistics were not so encouraging as could have been wished, nor are those now before you this new year. It will be well as briefly as possible to consider the facts just presented to us. In the Elementary Class of Design there is a falling off of sixty-eight attendances and seventy designs submitted; on the average eight less attendances, nine less designs submitted. The Class of Design is, however, encouraging,—forty-four more attendances, fifty-four more designs submitted; on the average five more attendances, seven more designs submitted. Again, in the Colour Decoration Class, progress has been made. Last session no statistics were forthcoming. Comparing this one with that of 1881-2, we find thirteen more attendances, seven more sketches; on the average three more attendances, two more sketches. Turning to the Class for Study of Planning and Specification Writing, seventeen more attendances, eleven more sets sent in; on the average three more attendances, two more sets sent in. Class Construction and Practice, thirty-four less attendances, eighty-one less papers; on the average five less attendances, ten less papers. Advanced Class of Construction, seven less attendances; but on the average two more than the previous session. The Surveying Class shows a decrease of five members below the two previous sessions. The lectures in connexion with classes of design gain by two attendances, those for construction by twelve, on the average one. The library report shows a falling off of nine in the number of readers. You will see, therefore, that though the annual report is right in pointing to "some advancement in the work of the Architectural Association, and some improvement in those respects which were referred to as being unsatisfactory, especially in the case of the Colour Class," still it is not so great as we all hoped and expected, especially if you consider the large increase of members. The falling off in the Elementary Class of Design is very noticeable, but some consolation may be gathered from the encouraging increase in the Class of Design, and Mr. Stannus, the president of this class last session, must be congratulated on this fact. The Colour Decoration Class has, I rejoice to see, shown fresh signs of life and vigour. There is also an encouraging improvement in the Class for Study of Planning and Specification Writing.

Then we are met face to face with a very serious falling away in the Class of Construction and Practice, and that for the Advanced Class of Construction is not much better. Referring to the latter, the report of the secretaries points out that six out of eight meetings advertised were held, four out of seven papers promised were read, and these were by members who contributed the previous session; but it should be noted that the average of attendances was higher. Lastly, the reports of the teacher of the Surveying Class and the librarian are not such as could be wished. Taking all the above facts into consideration, I think it will be admitted that the appointment of a special committee "to inquire into and report upon the present system of education as carried on in the various classes and lectures of the Architectural Association, with the object of rendering them, if possible, more efficient, and in other ways considering how the quality of the instruction and work done in the Architectural Association might be raised," has not been undertaken too soon, and that we must one and all devote our energies to finding some means for altering this state of things by taking a new departure. This special committee has not been idle. Their first business consisted in sending out a series of questions for the purpose of eliciting opinions, facts, and suggestions from those considered best acquainted with the working of the Association, and from others competent to advise. The result of this has been a mass of most valuable information, which has been duly tabulated by the honorary secretary of the committee, Mr. Frederick E. Eales, in a very thorough and comprehensive manner. This information has been, so to speak, boiled down, and the essence drafted into a report, which, early this session, will be brought before the special committee, and, when passed, laid before the general committee to undergo further revision. Then the whole result of these deliberations will be presented to you. The gist of the questions issued in the first instance I will briefly summarise, in the hope and expectation that those members who, from inadvertence, were not applied to, and others who have the cause of solid advancement at heart, may be induced to lend their help and forward their views at the very earliest day possible to Mr. Eales, who will, I feel sure, welcome any contributions, despite the further encroachment it may make upon a busy life. Briefly, then, the questions run thus,—and I shall restrict my summary to those upon which we most need information, and in any answers you may favour us with, kindly make them in the order in which I put them. The numbers here given agree with the printed paper to which your attention was called. (1) Is the system of education the best one? In what way do you think it can be improved? (2) What are your views of the quality and amount of work done in the classes with which you are best acquainted? (3) What are the points of failure, causes, and means of obviating them? (4) Would it be advisable to reduce the amount of work set down for each class meeting, with a view of making it more thorough? (5) Would you advise any test for admittance to the advanced classes? (7) Is it desirable to limit the period of members attending the elementary classes? (8) How can the advantages of the Association be extended to country members? And, lastly, in No. 9 we asked, In what other ways do you consider the usefulness of the Association might be extended?

That last question opens up a wide field, and, like the postscript to a letter, is, perhaps, as important as any of the previous questions. I hope that all those who are in this room to-night, and who feel that they can do something to make our machinery turn out more work and better, will answer to this call, as well as those who may chance to read my address in the professional journals. It is not out of place here to say how very much we are indebted to the editors of these papers for the large amount of space they give us; the compliment is a very high one, and I feel sure I may, as your President, convey our best thanks to these gentlemen for the courtesy extended to us,—a proof of the interest felt in our proceedings, and their continued record of them goes to prove that our doings outside these walls are carefully watched by our professional brethren, and an interest taken in our welfare. Were it otherwise, we should not see, at meeting after meeting, the faces of the reporters, now so familiar and so welcome to us. We owe the press this recognition of their valuable and useful services.

With the exception of the advanced Class of Construction and Practice, and the Class for the Study of Planning and Specification Writing, all the other classes which meet in this building have this rule, "Each member *must* contribute to the work of the class whenever he attends." A glance at the statistics given in the Brown Book will prove that this rule is not enforced. The attendances during past sessions have largely exceeded the work submitted in the various classes. It would probably be very difficult, indeed, to enforce a strict observance of this very salutary regulation; the frequent and constant disregard of it is, however, very discouraging, and shows how many drones we have in the hive. What remedies can be devised to meet this difficulty will doubtless form an important subject for discussion in the special committee. The real solution of the difficulty must, after all, remain with the members themselves, and I hope when the next Brown Book is issued we shall see some improvement. To contribute work will materially assist you; do not fear criticism: you may not succeed so well as you could wish, but you will certainly be the gainers by entering boldly into the contest.

Last session a sub-committee was appointed to consider whether the time had not arrived when the Architectural Association should publish the lectures delivered in this room. No action has as yet been taken although some statistics of probable cost have been collected together. The expense of such an undertaking could not fall, I think, upon the funds of the Association, nor could members expect to be furnished *gratis* with copies considering the small annual subscription they now pay. Whether the scheme ever takes definite shape must depend upon your own wish. If a sufficient number of subscribers could be guaranteed the experiment might be made, and I think some index of the feeling of our community might be ascertained if members would be good enough in the course of a week or two to send a post-card to the honorary secretary of the committee, Mr. H. W. Pratt, one of our vice-presidents, stating whether or no you are in favour of the work being undertaken. The cost, if a fair number of subscribers could be got together, would not be large, and no one will be committed to any subscription who is good enough to comply with this request. This proposition of publishing the lectures is not a new one, but, as we are considering a revision of our work generally, the present seems a fitting time to come to some decision upon this point. One strong argument against the necessity for publishing the lectures is that they are so well reported for nothing in the professional journals. This is so, and most highly should we value this boon; but then, on the other hand, no journal can be expected to publish our papers *in extenso* except when they have less claims upon their space, and, year by year, demands upon that are made from all quarters. Again, it is next to impossible to edit the productions with the exactness which a careful author would wish. When a man sees his composition in print it generally reads differently to him, and needs careful revision and some re-castiug. Though the journals give all the time they can to the authors, it frequently happens that the printer's boy has instructions to wait while the proof is being corrected, and so it cannot be done with that thoroughness which such work requires, and only practised writers can hurriedly bring their thoughts to bear on the work before them. Another drawback is that the papers are bound up with the other parts of the journal, and are not nearly so handy for reference, as they would be bound up separately. It is also urged against the proposed scheme that we should find a difficulty in getting the younger men to contribute papers if they had to face the ordeal of this special publishing. I think that objection may be dismissed. I believe it would have a contrary effect, and that we should procure even better and more carefully thought-out papers, and that the honour of reading one would be more highly coveted. The publicity which the press gives to our meetings is surely a more trying ordeal than the one proposed. Again, it is urged that the discussion took place among us as students, and that the ideas evolved from a discussion are hardly worth perpetuating. To this it may be replied, That the committee appointed for the editing and publishing of the papers would in the natural course of things have discretionary powers. I have dealt at some length with this question, because I think it is an important one; and before leaving it I will again beg of you to let the committee know what your own views are upon the matter, for the decision rests solely with the members.

The judges of the Essay Prize recorded with satisfaction the success achieved by the recipient of it last Friday week, but the committee of prizes felt themselves compelled to notice how very little interest is felt in essay-writing, and they go the length of suggesting that it should no longer be advertised in the Brown Book. I hope this will not become necessary. I think the fact that students do not care to compete in literary work is a sad and serious one. Let us for a few minutes consider the matter. It should be our desire to fit ourselves for any position in our profession and in society; but to do this we must possess those literary attainments which a learned profession and society demand from those who seek to take up a position in it. To write a good essay is not within the ability of many, but to endeavour to do so is in the power of most. To write an essay at all demands an acquaintance with the subject set down for competition, and this necessitates looking up facts and perusing works on the

* Opening address, delivered by the President, Mr. Cole A. Adams, at the meeting on the 24th ult.

subject. The necessity for a logical order, careful composition, and neatness of expression and dictum, affords most valuable discipline and teaching, and the result of the sacrifice of time to this pursuit cannot but result in good to the student. One satisfaction will be, that with practice he will find his thoughts will run more naturally to tongue and paper, and assist him largely in addressing meetings, committees, or public bodies, or in writing reports.* Again, the pursuit of references must needs open up studies which will be of use in ways little dreamed of at the time, and probably foster a love for reading and research which cannot fail to achieve as a result a cultured mind, which, I take it, is the *raison d'être* of the Essay Prize. I fancy when the profession was not so crowded as it is at present, and when good draughtsmanship was not so much thought of and practised as it is now, that *bonâ-fide* architects had, on the whole, a better right to the distinction of being called "learned." Previously to the Gothic revival, men devoted more time to the literature of the art, and what they learned was more thorough. With the Gothic revival came that improvement in draughtsmanship which has been so marked of late years, but I fear in too many instances the love of this charming occupation has shut out of sight the need for literary studies, and the fascination of being a good sketcher in perspective has been detrimental to that more solid good to the student which comes from measured drawings. It needs no very high order of intellect to be a clever draughtsman, and a too close devotion to this pursuit must debar the student from storing his mind with that knowledge of the literary and scientific part of his profession without which he cannot hope to hold his own with *savants*, or take that place in his profession, and in society, which should be his lawful ambition. Every year education makes strides, and we can only maintain our position in the world by showing we are worthy to do so; to neglect all efforts at culture, and the scientific side of our work, is simply suicidal. I do not think I have taken an exaggerated view of this question. Believing it to be of the utmost importance, I have made these few remarks; test the soundness of them for yourselves, and take council with those men who are best qualified to direct your studies. Give a little less time to draughtsmanship and making pretty sketches, a little more time to mastering the literature of your profession; go beyond this as opportunity presents, and study literature in other branches, and pleasure and profit will be the result.†

Society for the Promotion of Hellenic Studies.—As our article on this subject last week has brought us some inquiries as to the Society, it is well to add that the Hon. Secretary of the society is Mr. G. A. Macmillan, 29, Bedford-street, Covent-garden. We may also add that the leading European archæological periodicals of the day, and other works the property of the society, can be seen and consulted by members at any time on inquiry of Mr. Vaux, at 22, Albemarle-street, where the meetings of the Hellenic Society are held. The journals taken include the publications of the Archæological Society of Athens, the *Mittheilungen* of the German Society at Athens, the "Bulletin de Correspondance Hellenique," the Berlin "Archäologische Zeitung," the publications of the Russian Imperial Archæological Commission, &c., &c.

Leeds and Yorkshire Architectural Society.—On Saturday afternoon the members of the above Society paid a visit to York on the invitation of the President and Council of the York Architectural Association. Mr. Geo. Bradley, the residentiary clerk of the works of the Cathedral, conducted the party round the building, and in the crypt Mr. Bradley read a long and interesting paper, in which he clearly traced the architectural history of the buildings which have preceded, and some of which now form part of the present cathedral. The restoration works now being carried on under the direction of Messrs. Fisher & Hepper, architects, at St. Crux Church, Pavement, York, were next visited, and Mr. Hepper conducted the party over the works and explained to them the nature of the restoration.

* If Mr. Adams could see some of the letters that we receive from the architects, sometimes of works of considerable importance, full of errors of grammar, and even of the most extraordinary mistakes in spelling, he would think they added to the force of his exhortation.—Ed.

† The remainder in our next.

Illustrations.

ST. MICHAEL AND ALL ANGELS, STOKE NEWINGTON COMMON.

THIS church, which is fast approaching completion, is planned to seat 750, including the choir. The church consists of chancel, nave, north and south aisles (the south chancel aisle forms a morning chapel), organ-chamber, clergy and choir vestries, and a tower. The walls are faced externally with red brick, internally they are stuccoed, the arches and all quoins being of red brick. A feature of interest in the building is cast concrete (Albion Concrete Company), which is used in every case where stone would ordinarily be used (including a tracery east window), except for the columns. The church is being built by Messrs. Holliday & Greenwood, of Loughborough Junction, whose tender for the work was 5,242*l.*, without the tower. The architect is Mr. J. Edward K. Cutts, of Southampton-street.

DESIGN FOR WAR AND ADMIRALTY OFFICES.

BY MESSRS. SPALDING AND AULD.

WE give this week the Park view of Messrs. Spalding & Auld's design and plans, as usual, of the two principal floors. There are some fine points in the arrangement of the ground plan in regard to the disposition of the entrances, but a number of the rooms on both floors must surely be very insufficiently lighted. The architects send us the following statement in regard to their views in drawing up the design:—

"In the preparation of this design due consideration has been given to the matters especially dwelt upon in the conditions for the first competition, and emphasised more particularly in the revised instructions issued for the final competition.

In working out the scheme of plan the relative positions of the several sub-departments, the situation of the rooms on the various floors, and the order of their arrangement are all in strict compliance with the suggestions embodied in the official schedules, and follow as far as possible the sequence laid down therein.

The greatest simplicity has been aimed at in the block plan, which follows closely the natural outline of the site, the main object being to secure an ample provision of light and air and a general cheerfulness throughout. Small enclosed courtyards have been avoided, there being but two quadrangles, and these of large areas.

The space at command being limited for the accommodation required, the frontage to these quadrangles is appropriated to the official apartments, so that all rooms have a cheerful outlook to large open spaces, and the staircases and waiting-rooms are centrally disposed between the outer and inner ranges of offices.

Direct carriage communication between Whitehall and Spring-gardens is provided in compliance with special instructions.

The principal public entrances to the War Office and Admiralty are in the quadrangle next Whitehall, and are accessible from Spring-gardens by the carriage-ways above-mentioned.

Subsidiary entrances are provided for direct access to the various sub-departments. Private entrances also are given where required by the conditions.

Staircases are grouped near entrances, both being overlooked by messengers' lobbies, and having waiting-rooms in immediate proximity.

For convenience of access the repositories in connexion with ground and first floors are in basement, whilst those belonging to the second and third floors are in the attic over.

The warming, ventilation, and sanitation of the buildings, having to be specially provided for, a careful and complete scheme was submitted with this design."

Key to References on Plan.

THE WAR OFFICE.

A. Staff.
B. Surveyor-General's Department.
  B 1. Director of Artillery.
  B 2. ,, Supplies.
  B 3. ,, Contracts.
  B 4. Inspector-General of Fortifications.
C. Central (or Secretary of State's) Department.
  C 1. ,, ,, ,,
  C 2. ,, ,, ,,
  C 3. ,, ,, ,,
  C 4. ,, ,, ,,
D. Finance Department.
  D 1. Finance Department.
  D 2. Auditors.
E. Military Department.
  E 1. Military Secretary.
  E 2. Adjutant-General and Quartermaster-General.
  E 3. Intelligence Department.
  E 4. Deputy Adjutant-General R.A.
  E 5. Deputy Adjutant-General R.E.
  E 6. Army Medical Department.
  E 7. Military Education Department.
  E 8. Commissary-General's Department.
  E 9. Principal Veterinary Surgeon's Department.
F. Miscellaneous.
  F 1. Army Purchase Commission.
  F 2. Judge Advocate General.
  F 3. Pay Office. Commissariat and Transport and Ordnance Store Corps.
  F 4. Pay Office. Army Hospital Corps.
  F 5. Army Sanitary Committee.

THE ADMIRALTY.

A. Board-room Suite and Secretary's Department.
  A 1. Board-room Suite.
  A 2. Military Branch.
  A 3. Intelligence Branch.
  A 4. Naval Branch.
  A 5. Civil Branch.
  A 6. Legal Branch.
  A 7. Registry Branch.
  A 8. Record Office Branch.
  A 9. Copying Branch.
B. Hydrographer's Department.
C. Transport Department.
D. Victualling Department.
E. Controller's Department.
  E 1. Director of Naval Construction.
  E 2. Engineer-in-Chief.
  E 3. Director of Naval Ordnance.
  E 4. Store Branch.
  E 5. Dockyard, Ship, Gunnery, and Registry and Copying Branches.
F. Accountant-General's Department.
  F 1. First Division.
  F 2. Second Division.
  F 3. Third Division.
  F 4. Fourth Division.
  F 5. Fifth Division.
  F 6. Sixth Division.
  F 7. Greenwich Hospital Division.
  F 8. Auditors.
G. Director of Contracts Department.
H. Director of Medical Department.
J. Director of Works Department.
K. Naval Reserves Department.
L. Royal Marines Department.
M. Inspector of Naval Schools Department.

MANSION, WEST HARTLEPOOL.

THIS drawing, which was one of those hung in the present year's Academy Exhibition, represents a house to be erected at West Hartlepool, from the designs of Messrs. Banks & Townsend, architects. The plan, in connexion with the list of references, sufficiently explains itself, and shows some unusual and agreeable points in planning.

SKETCHES BY A DISTRICT SURVEYOR.

III.

AMBOISE is celebrated as having been the scene of an interview between Clovis and Alaric before the battle of Voulon, and it was to this castle during troublous times that the Guises fled from Blois with the young Francis II. After the assassination of the Duc de Guise, the château became a state-prison, and in it were from time to time confined a cardinal, archbishop, princes, and other persons of importance. Abd-el-Kader was detained there for five years.

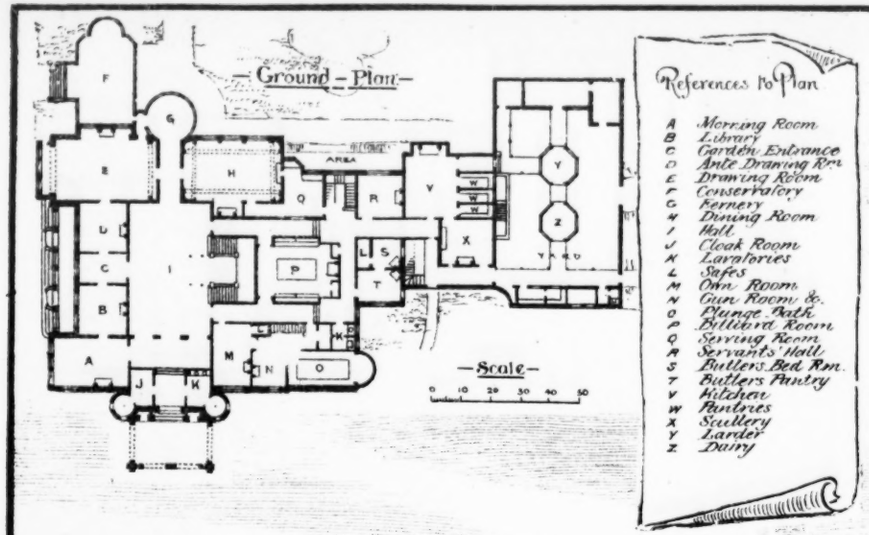
In the contests between Protestants and Catholics Amboise was the scene of most horrible atrocities, in which the whole court of Francis II. took part as a recreation after the latter had crushed the Protestants. Twelve hundred gentlemen of family were hanged, and the executions were witnessed by the king, who ordered them to take place after dinner for the delectation of the ladies. These religious wars devastated the country so much that the neighbourhood lapsed into a desert. The poor, driven from their homes, fled like wild beasts; bread could scarcely be found, and was made largely of walnut-shells; families eating roots and herbs boiled with remains of dead animals. The death-rate was frightful, and in one parish the return was "no more inhabitants."

The château building of the fifteenth to sixteenth centuries internally is much dilapidated; externally it has been reinstated partially. The Renaissance wing stands on one side of the court which has been converted into a public garden.

In the grounds were two chapels, one dedicated to St. Hubert, and in the other (St. Florentine) was buried Leonardo da Vinci in 1519, but this was destroyed subsequently, and in 1869 a small monument was set up on its site to the memory of the great artist.

The large building to the right and at the foot of the château is the Hotel de Ville.

T. E. KNIGHTLEY.



References to Plan

A Morning Room
B Library
C Garden Entrance
D Ante Drawing Rm.
E Drawing Room
F Conservatory
G Fernery
H Dining Room
I Hall
J Cloak Room
K Lavatories
L Safes
M Own Room
N Gun Room &c.
O Plunge Baths
P Billiard Room
Q Serving Room
R Servants' Hall
S Butlers Bed Rm.
T Butlers Pantry
V Kitchen
W Pantries
X Scullery
Y Larder
Z Dairy

Proposed Mansion at West Hartlepool for Matthew Gray Esq^re

J. Brooks & Sons Architects 1884

C. F. Kell Photo-Lith & Printer.

8, Castle St. Holborn, London, E.C.

8 Castle St Holborn London E C

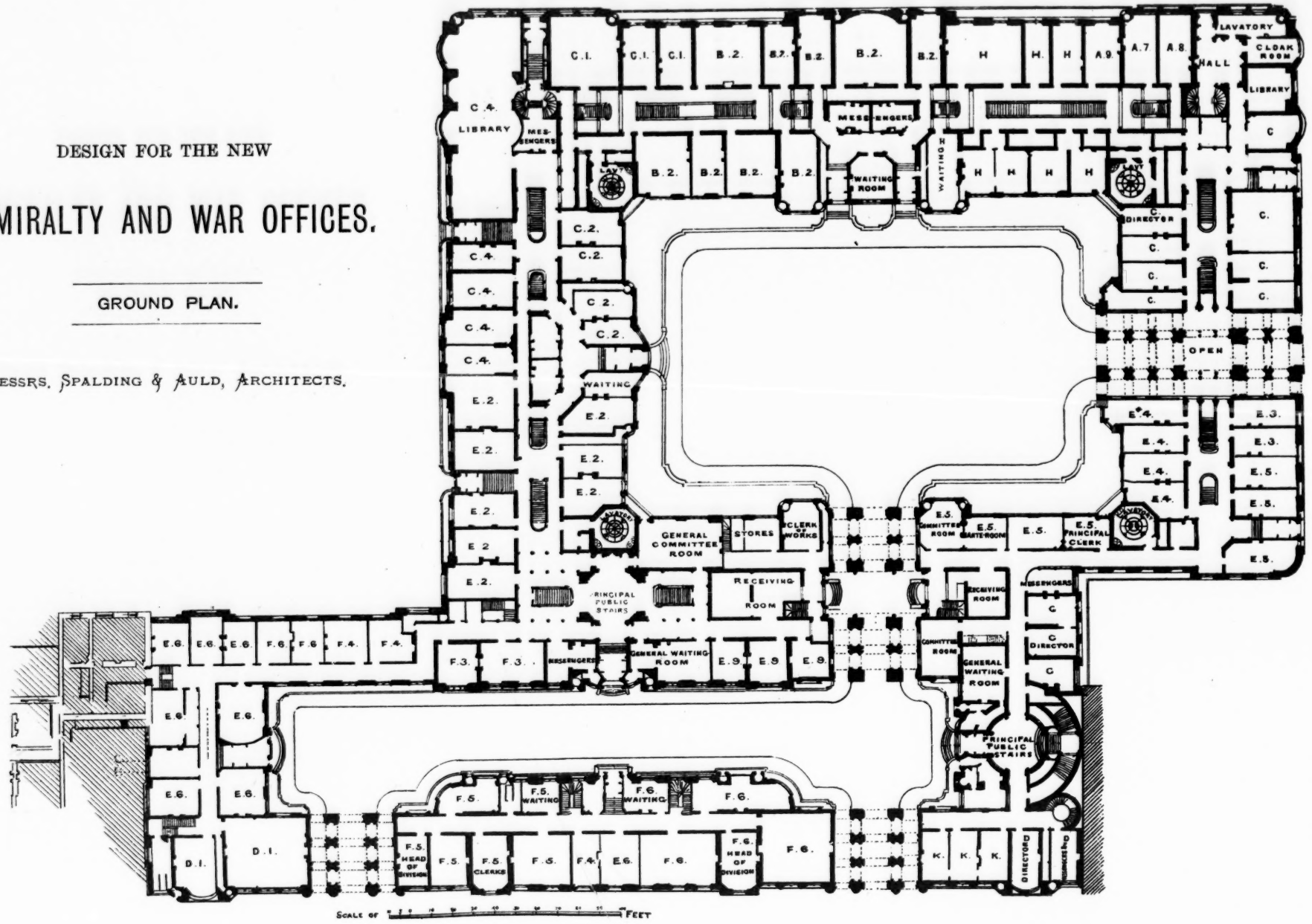
C. F. Kellgren Ltd. & Printer

DESIGN FOR THE NEW

ADMIRALTY AND WAR OFFICES.

GROUND PLAN.

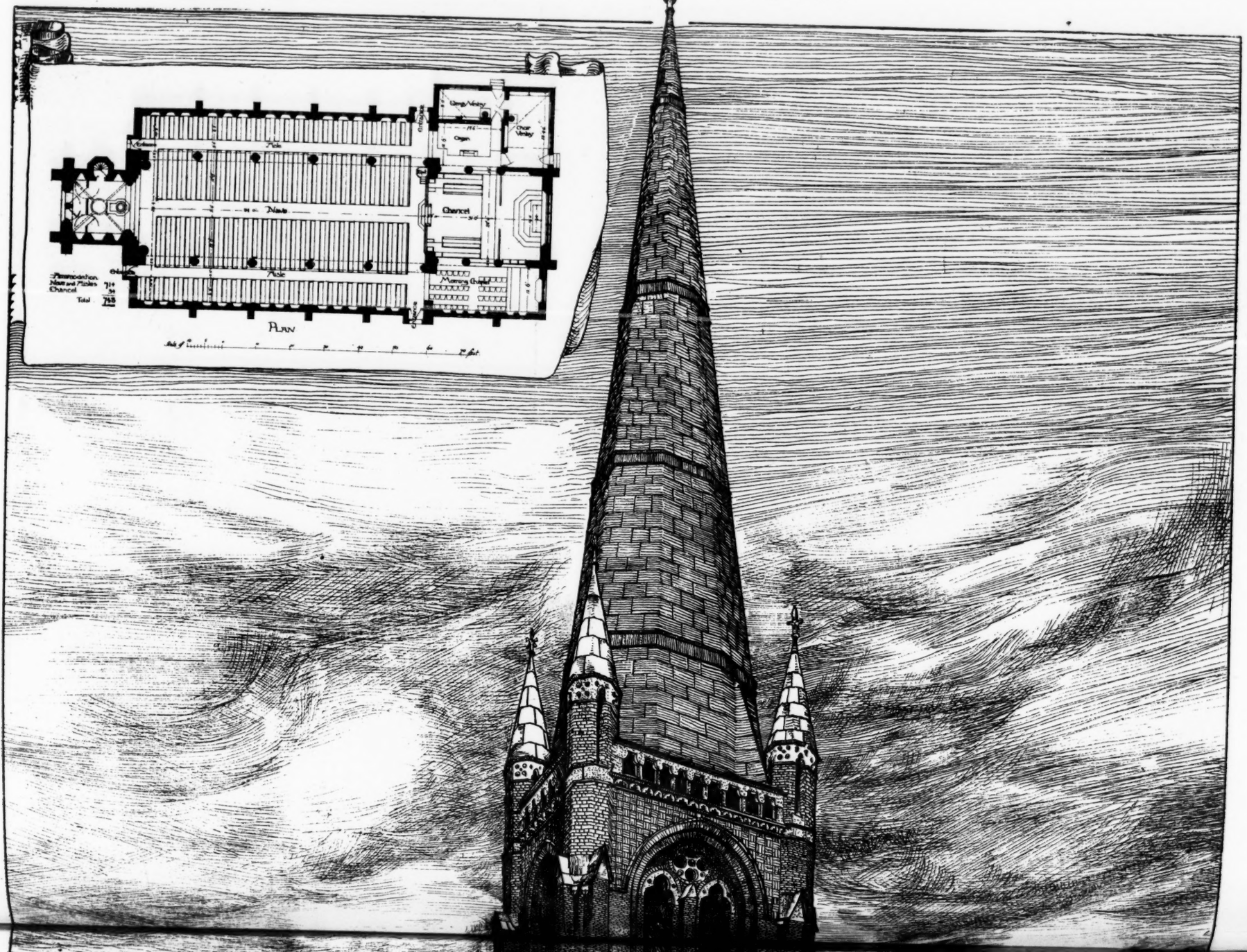
MESSRS. SPALDING & AULD, ARCHITECTS.

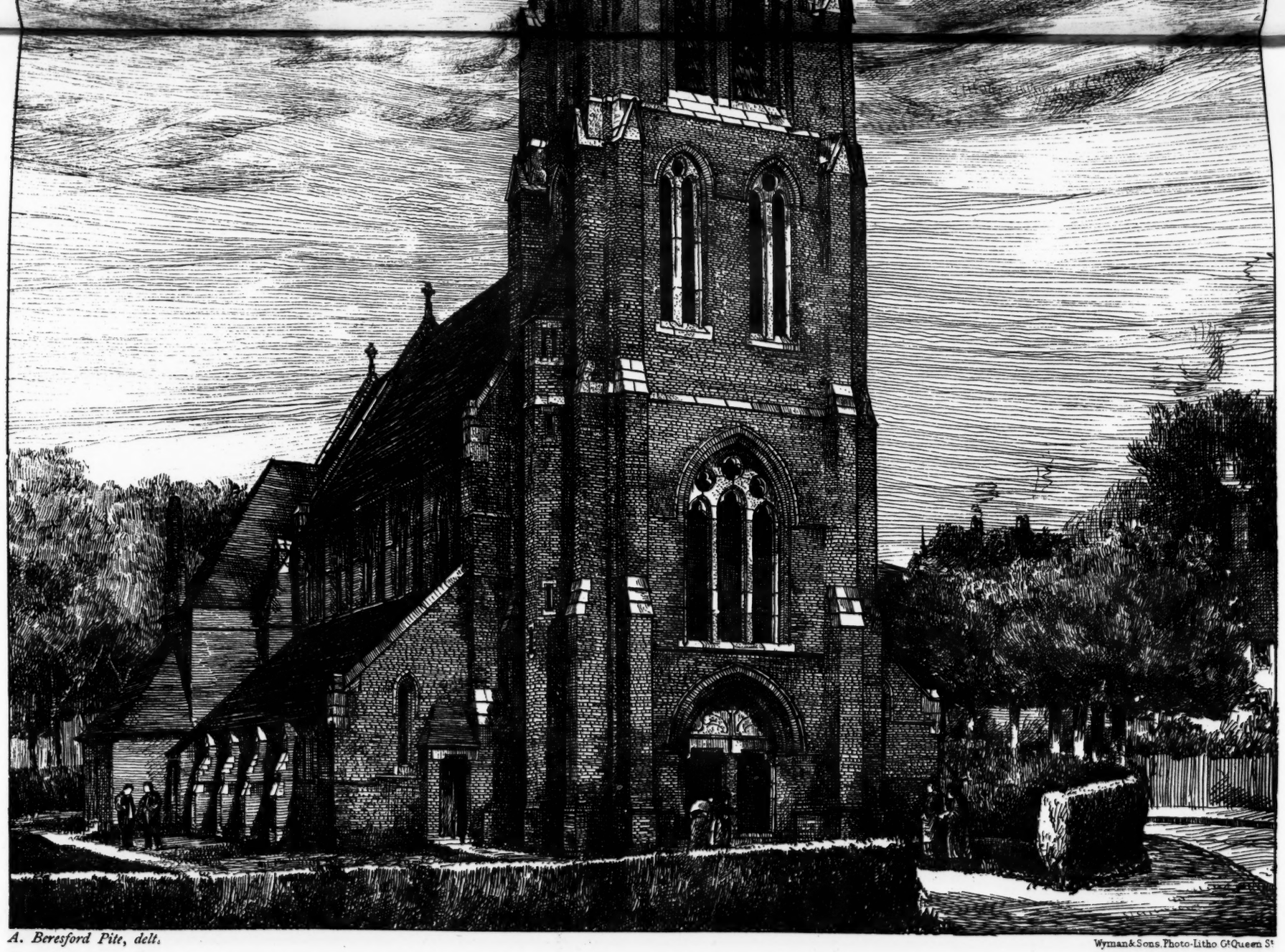


Wyman & Sons Photo-litho

G^t Queen S^t London, W.C.

wyman&sons photo-litho


Nave
Aisle
Aisle
Chancel
Organ
Choir Vestry
Morning Chapel
Porch
Plan



A. Beresford Pite, delt.

Wyman & Sons, Photo-Litho Gt Queen St

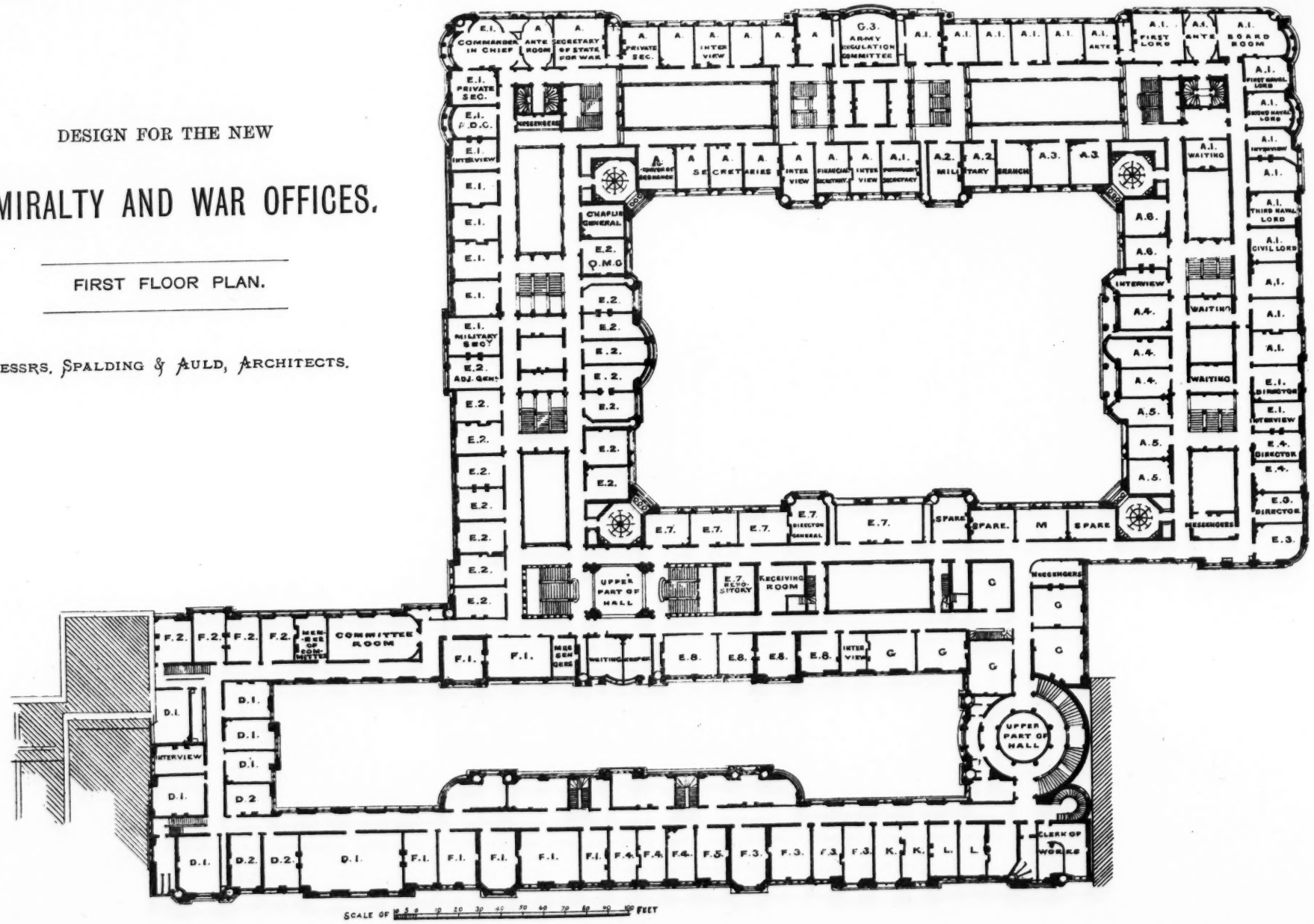
ST. MICHAEL'S CHURCH, STOKE NEWINGTON COMMON.——Mr. J. E. K. Cutts, Architect.

DESIGN FOR THE NEW

ADMIRALTY AND WAR OFFICES.

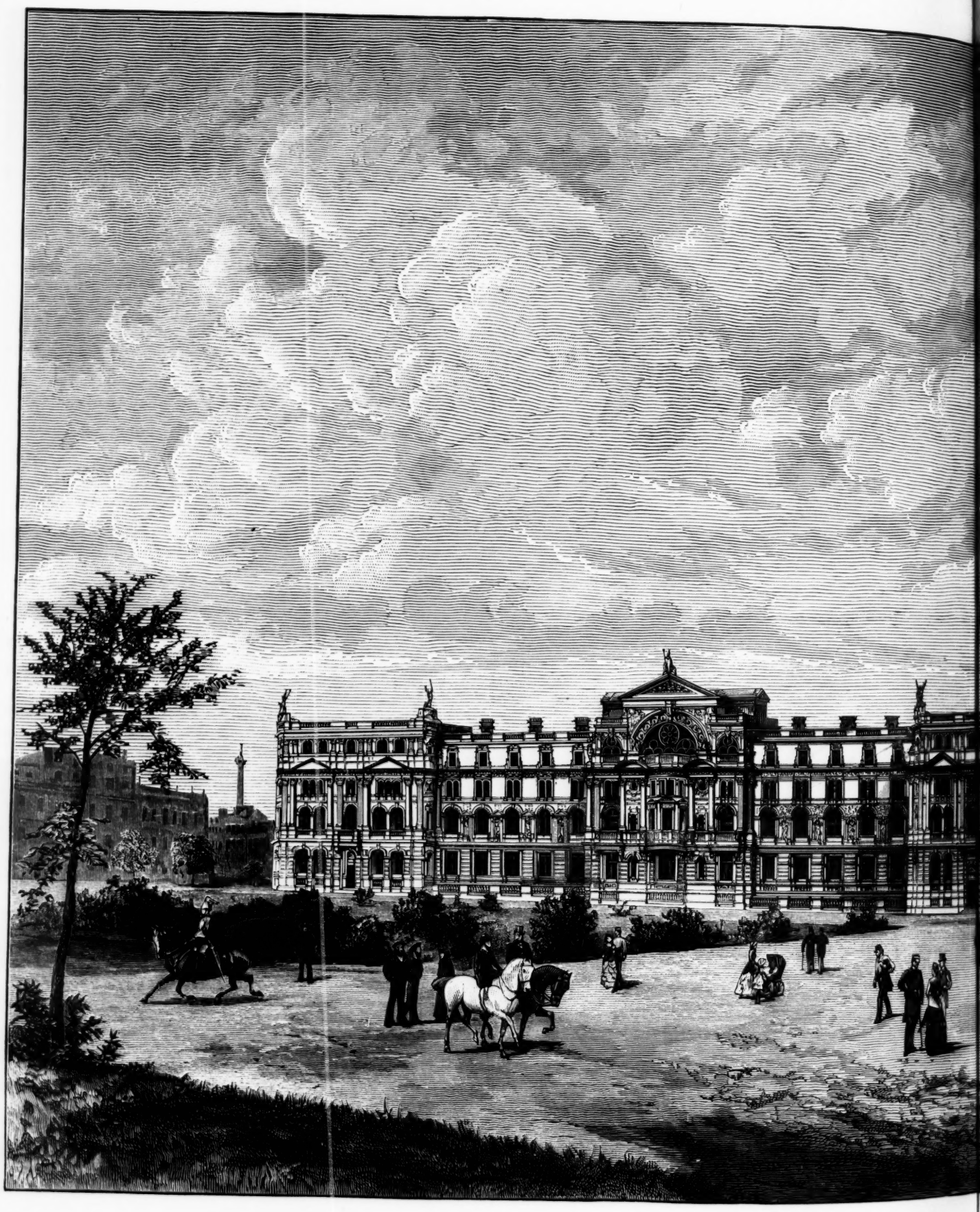
FIRST FLOOR PLAN.

MESSRS. SPALDING & AULD, ARCHITECTS.



Wyman & Sons, Photo-Litho.

C^t Queen S^t London, W.C.



DESIGN FOR NEW ADMIRA

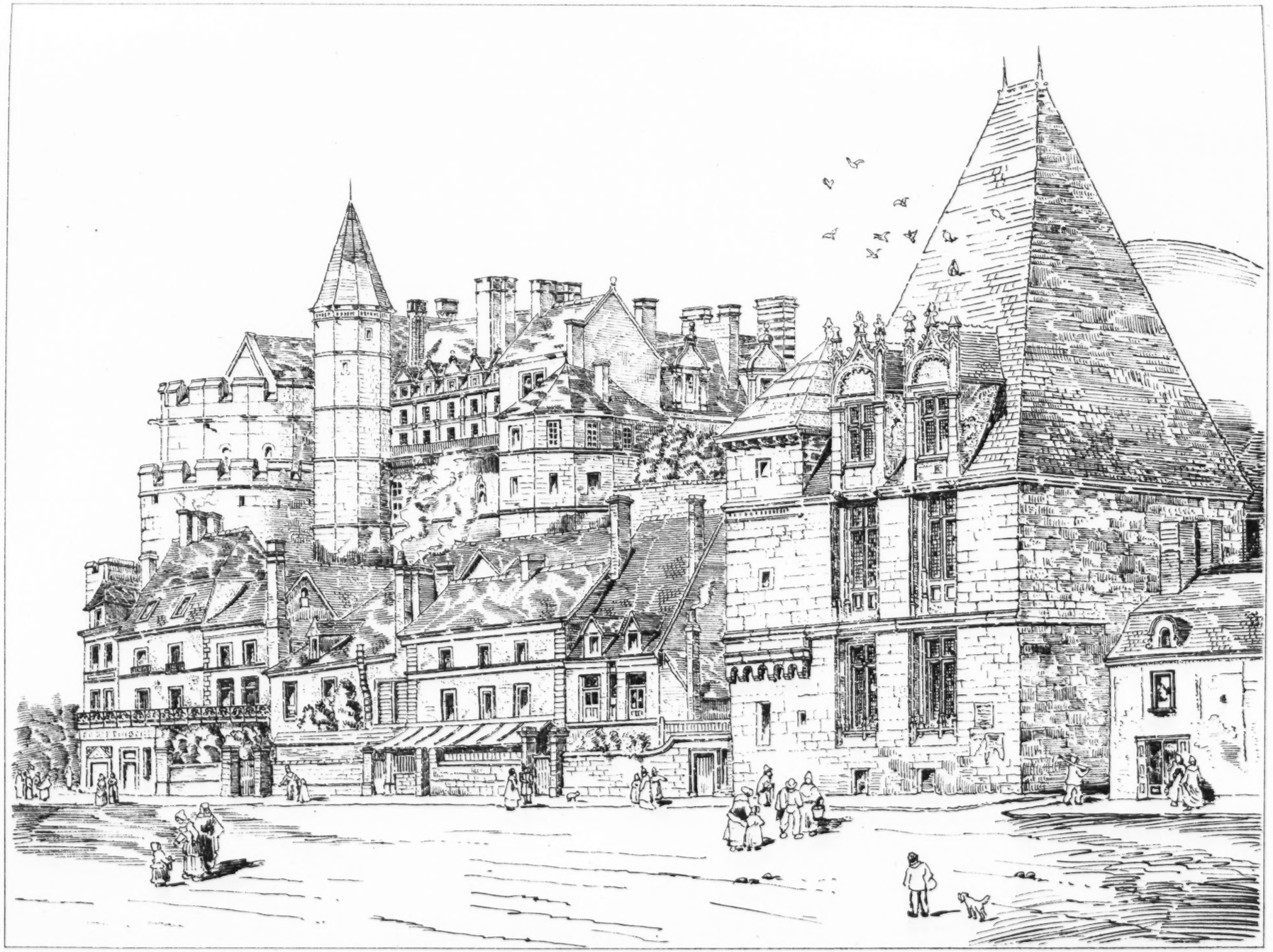
By Messrs. Spa

Park A

IIRALTY AND WAR OFFICES.

S. SPALDING & AULD.

Park Front.



C. F. Kell Photo-Lith. & Printer. 8, Castle St. Holborn, London, E.C.

SKETCHES BY A DISTRICT SURVEYOR. No. 3.

THE CHÂTEAU D'AMBOISE.

THE WATER FAMINE IN BRADFORD.

The water famine in Bradford is a matter of extreme significance, not only as regards the inconvenience to that populous centre, but as throwing incidental light on the unsatisfactory position of the entire question of urban water supply. Bradford, in the year 1882, contained a population of 183,080, on an area of 7,221 acres in the borough, and of 180,960, spread over 68,676 acres in the out townships, making a total of 364,040. Under nine Acts of Parliament the Bradford Corporation, in January, 1883, had expended 1,869,737*l.* on their waterworks. The supply of water obtained was, for domestic use, 25 gallons per head per day; and within the borough 3,096,000 gallons were daily supplied for other than domestic purposes. It was estimated that the daily waste amounted to 15 or 20 per cent. of the total daily supply of 8,800,000 gallons.

The charges for supply are high, ranging from 7½ per cent. on annual value up to 20*l.*, to 5 per cent. on the annual value exceeding 100*l.* There are extra charges for extra supply; and for trade purposes the water is sold at from 3½d. to 1s. per thousand gallons. In the summer, it is significantly added, the charge is 20 per cent. additional.

The sources of supply are from mountain drainage areas, springs, and streams, in the valleys of the rivers Worth, Aire, and Wharfe, the water being conveyed to Bradford by conduits and pipes, and supplied by gravitation. Fourteen reservoirs were at work, one was in course of construction, and several others were authorised by Parliament, at the date of the return on urban water supply in 1879; and no information on this head was asked for or supplied in the Parliamentary returns of the 9th of November, 1882, and the 2nd of April, 1883.

Three distinct services are described by the Rivers Pollution Commission as in use in Bradford, viz., a high-level service from the millstone grit; an intermediate service, derived partly from springs; and a low-level service, partly from this formation and partly from limestone. The area of the watershed is, in all, 13,250 acres. As the area to be supplied varies in its elevation from 300 ft. to 1,400 ft. above the level of the sea, the water has to be collected at great altitudes and led from considerable distances. The rainfall in 1879 ranged from 28·02 in. at the Exchange to 30·73 in. at Hewenden Reservoir, 700 ft. above the sea. Owing to the mode of collection, the working expenses incurred for the water supply are low, being little more than half those incurred in London, and considerably lower than those of any town in England of first-rate magnitude, except Leeds. But the rates are twenty per cent. higher than in London in proportion to the rateable value of the property, and the water revenue of the Corporation, per million gallons supplied, is higher than in any great town in England, with the exception of Liverpool, Sheffield, Manchester, and Birmingham.

Of the different methods of procuring urban water supply, it will be seen that the Corporation of Bradford have adopted that which is most easily affected by a season of drought; and that they are now suffering in consequence.* The incident is a strong illustration of the importance of a complete hydraulic survey of England, and of the division of the country into great hydraulic districts, each under complete supervision. While the collection of surface water is generally regarded as the cheapest and readiest mode of obtaining a supply, it should be remarked that Bradford, increasing its area of collection by little and little, has managed to arrive at a cost, per million gallons of supply, higher than that incurred for the works of any other town in England, of above 100,000 inhabitants, with the sole exception of Sheffield; where the cost has been rendered formidable owing to the unfortunate catastrophe of the bursting of a great reservoir. A water famine after a single dry season, and notwithstanding so considerable an expenditure (amounting in 1881 to 5·13*l.* per head) in the construction of works, is not reassuring as to the success of a municipal arrangement in providing a water supply, or in providing that prime necessary of life at a moderate cost. The plan of charging half as much again, in percentage on the rent, on a 20*l.* as on a 100*l.* house, has the effect of putting the highest charge for water supply on the poorest of the population.

* From latest accounts it appears that the difficulty is for the present practically at an end.

THE ARCHITECTURAL ASSOCIATION.

The first ordinary meeting of session 1884-85 was held on the 24th ult., at 9, Conduit-street, Mr. Cole A. Adams, the president, in the chair.

It was announced that the president had been invited to join the committee of welcome in connexion with the American Exhibition, proposed to be held in London in 1886. This invitation had been accepted by the president, and he had now been asked to communicate with their architectural brethren on the other side of the Atlantic, with a view to making the exhibition as interesting as possible.

On the motion of Mr. Conder, seconded by Mr. Gotch, the balance-sheet, as printed in the Brown Book, was adopted.

The President then delivered his inaugural address, which we give on p. 587.

In the discussion which ensued,—

Mr. Aston Webb, in proposing a vote of thanks to the President for his excellent address, thought that he had, perhaps, taken too melancholy a tone in thinking that the members did not work so well as they used to, and that there was not so much *esprit de corps* as in the earlier days of the Association. He believed for himself there was really a great amount of vitality in the classes, and as much interest now manifested in the work as ever had been. He congratulated Mr. Adams on being president for the second time, an honour which he deserved from the manner in which he conducted the work, and for the reforms he had suggested. The Association had undoubtedly outgrown its work, and required great extension, or its prosperity might bring about its overthrow. Their president had now become, as it were, a member of the House of Lords, and in that capacity they looked upon him as their representative in the solemn assembly upstairs. The members would be glad to hear some expression as to the way in which he proposed to represent their interests. Up to the present the results had been sparse; but he expected now to see the desired reforms rapidly carried through; therefore the meeting would be pleased to hear from their president that he was an ardent upholder of the Franchise Bill before the Institute, and that he would not allow the solemnity and chilliness of that august assemblage to interfere with the energy he had displayed in the lower house. With regard to sanitary science, he believed that architects knew all about it, and that there was no necessity to press the matter upon their attention. The President had touched upon the higher parts of the profession, and on an evening like this, which only came once a year, it was the point which should be more especially dwelt upon. The troubles and worries of ordinary workaday life were apt to engross their attention, to the detriment of the delights and charm of their profession; but there was no doubt that to produce good work they must ever have a high ideal before their eyes. They should look to art and not to science for the excellence of their work, not neglecting science, but recollecting that science without art would never produce a thing of beauty.

Mr. H. L. Florence considered there was a general improvement in the quality of work done in the classes. It should be remembered that the working strength of the Association could not be expected to be more than one-fourth of the whole number, therefore the proportion contributing to the classes could not be considered as unsatisfactory. At the same time he would like to impress upon the members the great advantages of the classes. It was impossible to obtain in an office that comparison of knowledge which was obtained in competition with others. He could speak on this point from experience, for he had learned more there than in any office he had been in. With regard to the system of education in this country and abroad, in the word "system" lay the whole secret of the case. In this country each one was left to work individually, and although in some instances it gave rise to great originality, yet the condition of architecture in England was not as artistic and complete as it was on the Continent. Mr. Florence seconded the vote of thanks.

Mr. J. A. Gotch remarked that one of the most important subjects which had been touched upon was the education of the architect of the future. The system of pupilage had answered to a certain extent, because it had produced all the architects we boast of; but, at the same time, it was very imperfect. Architects should not be compelled to seek their education in their spare time only, but should be able to devote the daytime to a regular system of education. The young architect too frequently occupied the whole day in doing little or nothing, while in his spare time he had to come there to acquire the often disagreeable rudiments of his profession. The question of the profession becoming a protected one was of the greatest importance; but he did not believe they would gain their point by merely appealing to the feelings of other people. What was requisite was to persuade the public that they were necessary to their health and comfort. It would be a pity to withdraw the competition for the Essay Prize, and he hoped that in future years they would get more and better essays.

Mr. Brodie hoped that more attention would be directed to the question of pupilage. He knew instances of men, with little or no work to do, taking five or six pupils, which he considered was obtaining money by false pretences.

The vote of thanks having been carried by acclamation,

The President thanked the members for the compliment they had paid him. With regard to his appointment on the council of the Institute, he had always been somewhat of a free lance, but it necessarily happened that the freest of lances, when he got into office, had to be reticent as to what he said in public. From the first time he took his seat at the council, however, he had been listened to with the utmost courtesy. He had been asked what he was going to do with regard to the important question of the franchise, and upon that point he had no reticence whatever. The Associates of the Institute ought to have a vote, and to the best of his ability he would argue this. No evil would result from their having this vote, but a great deal of good; and he believed there was really no opposition to it. With regard to sanitary science, it was necessary to view this matter soberly, if they were to maintain their position with the public. What was required was that the artistic man should become practical, while the practical man should strive to become artistic. Upon the correct writing of the quantities depended a knowledge of their work.

HEALTH EXHIBITION AWARDS.

The following awards have been made of the prizes offered by the Society of Arts at the International Health Exhibition:—

Joint Stock Prize, a Society's Gold Medal, or 20*l.*, for the best example of Sanitary Architectural Construction, Classes 20, 28, 29, 30, 32:—

Messrs. Doulton & Co.

Shaw Trust, a Society's Gold Medal, or 20*l.*, for the most deserving exhibit in Classes 41, 42, 43, and 45 (relating to Industrial Hygiene):—

Compressed Lime Cartridge Company. (In Class 45.)

North London Exhibition Trust, a Society's Gold Medal, or 20*l.*, for the best set of specimens illustrating the Handicraft Teaching in any school,—Classes 49 and 50:—

M. Germain, on account of the Collective Exhibit from the Belgian Normal Schools for Women Teachers. (In Class 49.)

Fothergill Trust, two Gold Medals (or two sums of 20*l.*), one for the best exhibit in Class 27 (Fire Prevention Apparatus), and one for the best exhibit in Class 26 (Lighting Apparatus):—

Messrs. Nobel Brothers. (In Class 26.)

Trevelyan Prize, five Gold Medals (or five sums of 20*l.*), for the best exhibit in each of the following Classes,—2, 3, 6, 7, and 11 (all comprised within Group 1, "Food"):—

San José Fruit Company. (In Class 2.)
Mrs. Charles Clarke, of the School of Cookery. (In Class 6.)
M. Pasteur. (In Class 7.)
John Moir & Son, Limited. (In Class 3.)
Messrs. J. & E. Hall. (In Class 11.)

The "Siemens" Prize, a Society's Gold Medal, or 20*l.*, for the best application of gas to heating and cooking in dwellings, Class 24:—

Thomas Fletcher (for Articles shown by Messrs. Deane & Co.).

The "Stacy" Prize, a Society's Gold Medal, or 20*l.*, for the best exhibit in Class 30 (objects

for Internal Decoration and Use in the Dwelling; fittings and furniture) :—

Messrs. Collinson & Lock.

*** In reply to several correspondents who have written asking us to mention that a medal had been awarded to them, we beg to say that we will print a synopsis of all the awards that have been made in regard to work connected with the building trades, and with sanitation and other subjects coming directly within the scope of this journal; but pressure on our space compels us to defer this till next week.

BUILDERS' ACTIONS.

CULLEY *v.* YATES.

In this action, at the Aylsham County Court, on Oct. 16 (before Mr. Julian Robins, Deputy Judge), which had been adjourned from time to time, the plaintiff, a builder residing at Aylsham, sued the defendant, the Rev. E. T. Yates, for 19*l.* 5s. 4d., balance due for work and labour done.

Defendant pleaded a counter-claim for 40*l.*, moneys alleged to be due to him from plaintiff.

Mr. Linay represented plaintiff, and Mr. Chittock appeared for the defendant.

Mr. Chittock said the action, which came on at a previous Court, was brought to recover the sum of 19*l.* odd, and defendant then pleaded a set-off of 50*l.* Plaintiff sued for work done, and he had also cut down timber that belonged to the defendant. He sold the timber, and was indebted to the defendant for all moneys received. They charged him in the set-off for moneys received on account of defendant which had not been given credit for. This was a short history of the transaction.

After hearing further argument, his Honour gave judgment for 28*l.* 2s. 3d. in favour of defendant, and costs.

THE DOME OF ST. PAUL'S.

My respect for the talents of Mr. Cave Thomas disinclines me to do more than express my own opinions and leave them side by side with his for the judgment of experts. As an architect I have spoken, as an artist he has replied.

But since it is most important that all argument on the subject should be based on a foundation of fact well authenticated, I venture to give my reasons for not accepting the statement which Mr. Thomas makes, that "Thornhill's architectonic arrangements were designed under Sir Christopher Wren's personal supervision, and that he not only sanctioned the scheme, but that it was carried out immediately under the eye of the great architect," who, by the bye, must have been about eighty years of age when it was done by Sir James Thornhill.

On page 441 in Dean Millman's "Annals of St. Paul's" it is stated that "The painting of the cupola had been taken out of his hands; it was now made over, contrary to his wishes, to Sir James Thornhill.

Again, in a letter by Sir Christopher to the Commissioners, dated January 25, 1710-11, he says:—"As for painting the cupola, your lordships know that it has been long under consideration that I have no power left me concerning it, and that it is not resolved in what manner to do it, or whether at all."

In fact, the directing of it had been taken out of his hands, to his great annoyance. See Longman's "History of St. Paul's," page 139.

I may say that I agree with Mr. Clayton that it would be unjust to the memory of Sir James to translate his bold design for a monochrome treatment (for which only it is adapted) into a brilliant polychromatic representation.

EDWARD C. ROBINS.

CROSIER AND PASTORAL STAFF.

Sir,—I quite thought that your last issue would have contained some reference to the opinions expressed by Canon Venables on this question, first raised in the "Student's Column," and I was disappointed at finding that it did not.

In favour of the distinction which you say exists between a crosier and pastoral staff there is the authority of several well-known writers. Mrs. Jameson, in her "Sacred and Legendary Art," page 684, says, "what is properly the crosier, the staff surmounted by a cross, is borne by archbishops." In a "Manual of Monumental Brasses," published by Parker, of Oxford, it says:—"The crosier and the pall were peculiar to archbishops. The former was a staff ending in a cross or crucifix instead of a crook." In the "Liturgical Reason Why," page 251, it says:—"Crosier, the pastoral staff of an archbishop, which terminates in a cross, whereas a bishop's staff terminates in an ornamental crook."

Webster's Dictionary (a less reliable authority, perhaps) gives *crosier*, from *crois*, now *croix*,—*cross*. "The official staff of an archbishop terminating at the top in a cross." I have no doubt that besides these (and Dr. Lee whom you have quoted) there are other learned authorities who describe the crosier as a staff terminating at the top in a cross, and it would be of interest, I think, if some of your correspondents would make them known. Perhaps the best proof of the existence of a crosier or cross as peculiar to archbishops and distinct from the pastoral staff is to be found in examples of Mediæval times. In Westminster Abbey, upon the monument of Robert Waldeby, archbishop of York (1397), the crosier or cross is represented in the archbishop's left hand. In the chapel of New College, Oxford, is a brass representing Archbishop Cranley (1417) holding a crosier which originally had as its head a crucifix. Many other instances could doubtless be produced, but these, I think, suffice to show that Canon Venables is in error in supposing that the cross peculiar to an archbishop was a processional cross, for the instances which I have named prove that the crosier (*i.e.*, a staff surmounted by a cross) was borne by an archbishop just in the same way that a pastoral staff (*i.e.*, a staff surmounted by a crook) was borne by a bishop.

There are instances amongst Mediæval monuments where an archbishop is represented as holding a pastoral staff and not a crosier, but these do not interfere with my contention, the pastoral staff being the proper emblem of authority over the flock within the diocese in which the archbishop exercises the office of bishop. The Monument of Archbishop Walter de Grey, in York Minster, affords an instance of this, the Archbishop being represented as holding a pastoral staff in his left hand, but it is to be noted that he does not wear the pall over his chasuble, and that, therefore, he is represented as the bishop of the diocese, and not as archbishop of the province of York.

S. SLINGSBY-STALLWOOD.

Reading.

SEA-SAND FOR MORTAR.

Sir,—No one who knows anything about mortar or limes would recommend salt, and no architect who knew the practical part of his profession would allow sea-sand to be used without its being washed.

If "F. L.'s" architect allows sea-sand to be used that is taken below high-water mark, the impression on his mind will end in a reality; but if the sand used is what is called "blown sand,"—that is, sand that has been blown up above high-water mark, and has been subject to rainfall,—it can be used without fear of unpleasant results. For example, at Exmouth there are mounds of sea-sand, covering several acres, which are not subject to the tide, which the sea never reaches, and which can be used without washing; while, on the other hand, sand taken from Dawlish or Teignmouth beaches must be washed, as it is covered by the salt water every six hours.

The plan adopted at most coast-towns in Devon is to store the sand and expose it to rainfall before using. The rain-water passes through the sand and carries away the salt as it passes off at the base of the heap. Sand treated in this way can be used without fear of bad results.

Exeter, Oct. 27th, 1884. CHARLES PINN.

Sir,—I quite agree with the remarks of "H. L." in your last number (p. 575) as to the use of sea-sand in mortar.

After fifty years' experience, and having seen some of the largest works in this neighbourhood, especially at Brighton, Hastings, and Eastbourne, where the sand has been brought daily direct from the sea and used without washing, I am convinced that where damp is discovered in a building other causes must be sought for rather than the sea-sand; and in our country districts where sea-sand cannot be procured the same appearances and efflorescence present themselves.

Both the old County Prison, with its thick brick walls grouted solid, and also the new County Prison, are built entirely of sea-sand, and I have never had cause to notice the slightest ill-effects from its use.

Before Portland cement was known the floors of barns, malt and coach houses, used to have a sprinkle of common salt put on them to harden the grey lime surface, and all old bricklayers will speak of the strength of sea-sand mortar over that of washed or land-sand.

HENRY CARD, County Surveyor.

Lewes, Oct. 27, 1884.

Sir,—Fearing your correspondent "F. L." might be led into the serious error of using *unwashed* sea-sand after reading the experience of your correspondent "H. L.," I beg to offer my advice on it, which is "Don't." I should think the *unwashed* sea-sand of "H. L." must have been taken far above high-water level, where it had been well bleached by the sun. I have used such without any ill effect. I have also used the sand taken below high-water level, and have found that when carelessly washed the effect on the plastering was most disastrous. It was always slightly damp in the driest weather, but during a damp season it was simply wet. When thoroughly well washed it will make good mortar, neither better nor worse than good pit or river sand, but it must be washed, particularly for plasterers' work. If "F. L." must use sea-sand on the score of economy, let me advise him to see that it is thoroughly washed, or he will not be so fortunate as "H. L." There will be no danger of his having complaints, for the reason that he will find no one to occupy the houses.

F. DASHWOOD.

Sir,—As the question of the suitability of sea-sand as an ingredient of mortar has been raised in your columns, and, as I notice, denounced by you, unless the sand has undergone a thorough washing, I shall esteem it a favour if you will inform me whether you consider sand obtained from some distance from the sea shore open to the same objection.

I am engaged in building a house, the mortar for which is mixed with sand obtained some 200 or 300 yards from the shore, and which probably has not been submerged for centuries. Would not the salt in this case have evaporated to such an extent as to render the sand safe for making mortar?

J. S.

*** Possibly; though we opine that if "J. S." sinks a hole deep enough to come to water, 200 yards from the sea, he will probably find it salt; and that, even in this case, a cleansing of the sand would be an error on the safe side.

EGHAM SCHOOL BOARD COMPETITION.

Sir,—In the last number of your journal I observed a letter from Mr. B. Tice, clerk to the above Board, stating that 103 architects applied for particulars, and informing the forty-nine competitors that the Board have now decided to seek competent assistance to enable them to make a selection. Doubtless the forty-nine will be pleased at this decision; but as one of the fifty-four who applied for particulars, but did not compete, I should like to say I think it would have been much more just if the Board had decided upon this course in the first instance, before receiving designs, as I have no doubt the majority of the fifty-four were, like myself, debarred from competing in consequence of having agreed, with about 1,400 of the profession, not to compete for any work unless one or more professional assessors of established reputation are appointed to assist the promoters in adjudicating on the relative merits of the designs submitted in competition; and in this case, Mr. Tice, in reply to my inquiries, stated that he was not prepared to say whether a professional assessor would be appointed.

R. T. ELSAM.

A WAIL FROM SOUTH KENSINGTON.

Sir,—Disgusted inhabitants of South Kensington are calling out about the exhibitions of Fisheries, Healtheries, and all the other "'ries" about to take place in their locality, and very justly so; but it is of no use without suggesting some way of getting out of their difficulty. May I therefore propose that the Council of such "Exhibitioneries" should be obliged to construct a tunnel from the railway, as proposed last year, into their own grounds, and to do away with the present principal entrance to the building, making another in connexion with a large yard on their own ground, where all omnibuses, cabs, and carriages would set down and take up passengers, the police having orders to refuse those noisy penny vagabonds who annoy the neighbourhood from entering such yard or loitering anywhere about the building?

The proprietors of such a paying concern as an exhibition such as the Healtheries should keep the nuisances they cause on their own ground, and not be the means of ruining a respectable neighbourhood.

G. T.

Leicester.—The Temperance Hall has recently undergone repairs and redecoration. While this work has been progressing the services of Mr. Frank Ashwell, heating and ventilating engineer, have been called into requisition by the directors, with a view of remedying the numerous draughts which have for several years past been complained of by those attending public meetings or entertainments in the building. The system adopted is Körting's patent. The main principle is to keep up a regular current of air, and by means of proper outlet shafts to provide that the foul air should be as regularly discharged, thus securing a constant supply of warm and pure air. By means of an anemometer, it has been ascertained that the whole body of air in the large room can be changed two or three times every hour.

PROVINCIAL NEWS.

Ashington.—On the 18th ult. the foundation stone of a new co-operative store and of a new temperance hotel, for the Ashington Old Co-operative Society, was laid by Mr. Jonathan Priestman, J.P., of Shotley Bridge, at Ashington Colliery. The new institute about to be erected will stand at the entrance to the village, and will face the turnpike road leading direct to the Hirst Station. The front elevation will be 118 ft. in length, and will consist of shops and manager's house, with a lecture-hall, 68 ft. long, above. Behind these there will be ample warehouses, workshops, a drapery establishment, and other departments. At the extreme east end of the front part the temperance hotel will be situated. The new building will be built by Mr. Lilburne, from designs furnished by Messrs. Oliver & Leeson, architects, Mosley-street, Newcastle.

Oxford.—On Thursday, the 16th ult., a public inquiry was held in the Council Chamber, by Captain Hildyard, R.E., one of the engineering inspectors of the Local Government Board, with reference to an application by the Oxford Local Board, for sanction to borrow a sum not exceeding 2,000*l.*, for the sewerage of New Botley, and connecting the same with the Oxford main drainage system by pumping. The only persons present were the Chairman and Clerk of the Local Board and Mr. W. H. White, engineer. After taking evidence upon the financial and engineering features of the scheme, the Inspector visited the site of the intended works, and afterwards inspected the Sewage Pumping Station and Farm, at Littlemore and Sandford.

Wakefield.—A new billiard-room has just been added to the Bull Hotel, Wakefield. The room has been erected at the rear of the hotel, and is 45 ft. long, 18 ft. 6 in. wide, and 12 ft. 6 in. in height. It is well lighted by two lantern lights, and has a flat roof constructed with iron joists and concrete, and covered with Seyssel mineral asphalte, which has been laid by Messrs. Claridge & Co.'s own workmen. The ceiling is executed in plaster, and is divided into panels containing enrichments. Attached to the room is a lavatory. The billiard-room is warmed by one of E. H. Shorland's ventilating stoves, and fresh air is also supplied by his system. On the roof are fixed three of Boyle's extracting air-pump ventilators. The floor is laid with Lowe's herring-bone wood block paving, which makes a clean, warm, and noiseless floor for such a room. The work has been executed by tradesmen of the town, viz., Messrs. Flower, Bros., C. Driver, C. Squires, E. Kirk, and C. Turner, from the drawings and under the direction of Mr. William Watson, architect. The room is supplied with two tables by Burroughes & Watts.

Stockport.—Navigation Bridge is now completed, and we quote the following particulars respecting it from a description given by the engineer, Mr. Thomas Mitchell, of Oldham:—To economise money as far as possible the two side girders and an intermediate one (carrying the water pipes) of the late bridge have been used in the present one. The new roadway is formed with ten intermediate box girders, each capable of carrying 400 tons, thus giving a total carrying power of 4,000 tons. These girders are 2 ft. 6 in. apart, and at right angles to them and resting on the beam ranges are transverse joists, spaced 1 ft. 6 in. The roadway to the depth of the beams and including the interior of the beams is filled up and rammed full of strong cement concrete and finished with a smooth surface at the top, on which is placed a covering of strong waterproof asphalte so as to keep the ironwork drop-dry and from atmospheric exposure. The road paving comes last, bedded in sand, and grouted at the joints with pitch and gravel. In answer to numerous inquiries, Mr. Mitchell says that the strength of the concrete is such that in this case the ironwork would be the first to yield. He thus states his reasons for filling up the box beam with concrete:—

"1st. When the beams are solid, there is no chance of corrosion from the interior.
2nd. The webs are kept rigidly apart, and, from being unable to buckle, must necessarily be stronger.
3rd. As a natural sequence to No. 2, and proved by experiment, beams when filled with concrete attain a much higher breaking strain than when empty.
4th. To increase the *dead load*, as the weight of the structure is called (the beams in this case being very shallow), and thus reduce the vibration of beams during the passage of traffic."

He cites as an apt illustration of what he wishes to explain is found in the great tidal wave which followed the recent eruption in Java. This wave broke on the American coast a few hours after the explosion, having with enormous velocity travelled some thousands of miles. "Now," says Mr. Mitchell,

"It was not the mass of water which travelled, but simply the component individual molecules, which, impacting on each other, conveyed the force imparted to them by the explosion. So, too, the rolling of a wheel gives off impacted force at each point of its circuit, and the vibration caused in a beam over which it travels is due to the molecular action, which conveys the impact to the ends of the beam, and thence to the ground. Therefore, it follows that the vibration must be greater in a light beam than when fully loaded up, and consequently possessing more molecular inertia. Of course, this proposed additional loading only applies to structures such as this, where the live load may be at times in excess of the dead load. Any one going under the bridge will also notice the absence of that hollow ringing sound so usual in this class of bridge when traffic is passing."

The new bridge is 2 ft. lower in the roadway than the one projected by the late borough engineer, and 6 in. lower than the original Canal Company's bridge, and by lengthening the gradients from Lancashire-hill the Highway Committee have rendered this a much easier road than heretofore. The mishap that befell an old field drain by a pile being driven into it was not altogether a misfortune. If it had happened after the bridge and roadway were complete, then incalculable damage might have resulted. Says Mr. Mitchell:—

"The drain was in some places nearly silted up with mud, and generally in bad repair, requiring only a little further time to collapse of itself. From its devious course it must have followed the windings of a natural water-current, and the man who constructed it suited the width to his passing fancy or the materials at hand. Sometimes he would make it 15 in. wide, then work it down to 9 in., and gradually pull it back to 15 in. in the most free-and-easy fashion. He evidently used no setting-out lines, and although untrammelled by a School Attendance Committee, worked it nearly into the letter 'S' where it passed under the bed of the canal. As no Local Board or Sanitary Authority took particular notice of the drain, it was allowed to lie unhonoured and unknown until disturbed by the rude hand of modern improvement."

The contractors were Messrs. Froggatt & Briggs, the sub-contractors for the ironwork being Messrs. Homan & Rodgers.

Stratford-upon-Avon. — Provision has now been made for protecting the house in which Shakspeare was born from disaster arising from lightning. On the 9th of August last, Mr. W. T. Hawkings, manager for Messrs. W. D. Berry & Sons, electric engineers, of Huddersfield, noticed a paragraph in a Birmingham paper to the effect that a ball of fire had been seen to fall near Shakspeare's birthplace. It occurred to him that a building of so interesting a nature and containing articles of such great value should be protected from lightning, and he at once put himself in communication with the trustees through the secretary, Mr. Lever, and eventually received their instructions to erect conductors on the building according to specifications submitted. The work has now been carried out. Messrs. Berry have fixed their 1 in. by $\frac{1}{8}$ in. solid copper tape conductors on each end of the building, and carried them direct to earth. The termination in every case is carried some feet away from the building, and the extreme end of the tape is riveted to an induction earth plate of gridiron form, made with the same material as the conductor. A third elevation rod is attached to the second chimney on the front of the building, and a $\frac{3}{4}$ in. by $\frac{1}{8}$ in. copper tape is connected to it and carried to a fourth elevation rod on the gable-end at the back of the house, from which a 1 in. by $\frac{1}{8}$ in. tape runs direct to earth, and terminates with an induction plate, as before stated. Each of these plates is buried in carbon in order that the current may be more quickly dispersed.

Exeter.—The Exeter Town Council have accepted the tender of Mr. Samuel Pearse, of Exeter, for supplying the kitchen fittings for the new pauper lunatic asylum now being built at Exeter by Mr. H. Phillips, from the designs of Mr. R. S. Wilkinson, architect, of Furnival's Inn, London. Mr. Pearse's estimate is 654*l.* 5s. If a Perkins's patent steam oven be substituted for the baker's brick oven specified, however, he will receive the additional sum of 145*l.*——Extensive additions are now in progress in the rear of Mr. Harry Hems's ecclesiastical art works in Longbrook-street, Exeter. It is scarcely three years ago that he erected his present premises, and the extensions now mooted will give an entire run of shops of upwards of 300 ft. The new building has been designed by by Mr. R. Medley Fulford, architect, of the Close, Exeter, who was also architect for the first portion. The new works are being carried out by Mr. Hems's own staff of men.

Truro.—Extensive new premises have just been erected in St: Nicholas-street, Truro, for Messrs. Criddle & Smith, house-furnishers. The architect of the new buildings is Mr. Hicks, Redruth. The contract was taken by Messrs. Farley & Battershill. The painting and decorating was entrusted to Mr. Glasson, the plumbing to Messrs. Cock & Son, and the ironwork to Messrs. Harris & Polmear.

Pudsey.—A new boot and shoe factory, for Messrs. Scales & Salter, is approaching completion. The premises, which are very extensive, will cost about 10,000*l.* The works have been undertaken by the following contractors:—Excavating, mason, and brickwork, Mr. Wilks Greaves, Pudsey; carpenter and joiner's work, Messrs. John Thomas & Son, Idle; iron-founders, Messrs. E. & W. H. Haley, Bradford; plumber and glazier, Mr. George Lazenby, Leeds; plasterers, Messrs. J. & H. Etherington, Pudsey; slaters, Messrs. Hill & Nelson, Bradford; and painter, Mr. J. Dickinson, Bramley. The hot-water apparatus has been put in by Mr. E. Oldroyd, of Leeds, and the engines and pump are being made by Mr. R. Middleton, Leeds. Mr. J. Bennett has acted as clerk of the works, and the whole has been carried out from the drawings, and under the superintendence of the architect, Mr. C. S. Nelson, of Leeds.

Eastbourne.—Mr. J. P. Knight, the General Manager, and several of the directors of the London, Brighton, and South Coast Railway Company visited Eastbourne on the 23rd ult., with a view to inspect the site and definitely decide upon the plans for a new station, in accordance with the intimation recently given by the general manager at the mayor's luncheon, on the occasion of the laying of the memorial stone of the town-hall a few days since. It is intended to erect an entirely new building, and to greatly extend the present platform accommodation.

Bedford.—The new roadway bridge over the Ouse at Bedford, the foundation-stone of which was laid by the Mayor of Bedford twelve months ago, was opened to the public on Tuesday, October 21st, by Earl Cowper, K.G. Among those present were the Marquis of Tavistock, Lord Charles Russell, Mr. Whitbread, &c. The whole cost, exclusive of land, has been 8,000*l.*, which is within the original estimate of the engineer, Mr. J. J. Webster, of Liverpool. The contractors were Messrs. Pilling & Co., for the masonry, and Messrs. Goddard & Massey for the ironwork.

Liverpool.—The City Engineer of Liverpool (Mr. Clement Dunscombe, M.A., M. Inst.C.E.) has been awarded, by the Jury Commission of the International Health Exhibition, a gold medal for his designs for Artisans' and Labourers' Dwellings, and the Corporation of Liverpool have been awarded a Diploma of Honour for the exhibit. These designs embrace the Nash-grove Dwellings, now being erected by the Corporation, under Mr. Dunscombe's supervision, at a cost of 53,000*l.*, exclusive of the value of the site.

CHURCH BUILDING NEWS.

Birmingham. — The church of St. Philip, to which a spacious chancel has recently been built in harmony with the original structure, has been fitted with carved oak choir-stalls, designed specially to suit the Classic architecture of the building. The whole of the work has been carried out, under the immediate supervision of the architect, Mr. Chatwin, of Birmingham, by Messrs. Jones & Willis, of Birmingham, who also made the wrought-iron communion-railings. This firm have also completed a pulpit in oak and iron for the same church.

Sedgefield.—The Church of St. Luke, erected at the Durham County Lunatic Asylum, Sedgefield, for the use of the patients and officers of that institution, was consecrated by the Bishop of Durham on the 3rd ult. The church is built of brick, in the Early English style, and consists of a nave, with north and south aisles, chancel, organ-chamber, and vestry (with heating-chamber below), while at each side of the west porch is provided a retiring-room and lavatory, &c., for the use of patients who may be taken ill during the service. The whole of the building, inside and out, is faced with Sherburn House bricks. The moulded strings, plinths, and arches are of pressed bricks made by the Commondale Brick Company; and the

terra-cotta is from the works of Messrs. Doulton & Co., Lambeth. Internally, the nave is divided into six bays by columns built of Commondale pressed bricks, with terra-cotta moulded caps, bases, and bands, and small clustered shafts of polished slate, carrying arches of moulded pressed bricks. The seats in the nave and aisles, and the roof-timbers and joiners' work generally, are of pitch pine; the chancel-seats, reading-desks, and reredos are of oak; the chancel-floor is laid in Maw's encaustic tiles. The pulpit is of Bath stone and alabaster, and has been executed by Messrs. Jones & Willis, of Birmingham, from the architect's designs. The organ was built by Messrs. Willis, of London. Sittings are provided for 715 persons, and the entire cost (exclusive of organ) has been 3,880*l.*, or 5*l.* 8s. 6d. per sitting. The church was designed, and its erection superintended, by Mr. William Crozier, jun., son and chief assistant of the Engineer and Architect for the County of Durham. Mr. Jonathan Johnson, of West Hartlepool, was the sole contractor for the work, and he has carried out his contract in a highly satisfactory manner; the plumbing and gas-fitting he entrusted to Mr. James Laidler; and the painting and glazing to Mr. Phillips, both of the city of Durham. Mr. T. Waite, clerk of works to the Asylum, was clerk of works. The buildings have been heated throughout by hot water by Messrs. Haden & Son, of Trowbridge.

Huddersfield.—St. Paul's Church, Armitage Bridge, was re-opened on the 15th ult., after undergoing interior decoration. The chancel walls to a height of 4 ft. are done in a rich russet-red, over which is a diagonal diaper in a lighter shade and in gold, and surmounted by a broad border of sacred monograms worked upon a dull gold ground. The wall space above this is divided by shafting and canopy work into compartments, to allow of the introduction of figure subjects, which latter are painted in a strong outline with the addition of a little colour here and there, and backed up by a dull blue ground. The chief subjects are excerpt from the life of the patron saint. In addition to these large cartoons there are smaller ones; and on either side of the east window figures of St. Peter and St. John. Immediately above the altar are four demi-angels, each holding a riband text "Alleluia," and a larger riband is carried over the table to contain the legend, "Proclaim ye the Lord's death till He come," the whole being worked upon a gold ground upon which is displayed the "fruitful vine." Above this subject-work, the remainder of the walls are diapered in gold and colours, texts being carried over each window and arch, borders and other ornaments emphasising the salient points of the architecture. The roof panels of the chancel are decorated in neutral tints and blue, upon a light stone colour; whilst the wood rafters and principals stand boldly forth in strong and vivid colouring, red, gold, and black predominating. The whole work is from the designs of, and has been executed by, Messrs. Powell Brothers, of Leeds, under the supervision of Mr. W. Swinden Barber, architect, Halifax.

Bishop's Cannings (Wilts).—The parish church of St. Mary the Virgin, having been under renovation for the past eighteen months, has just been re-opened. It is a cruciform edifice with a fine Early English tower, surmounted by a Perpendicular spire, which is a marked feature some three miles from Devizes upon the high road to Bath. The tower was very unsafe. It has been underpinned, and is now practically stronger than when first erected. The roofs are partially new, and of massive oak. The walls have been stripped of whitewash, and the masonry everywhere carefully dealt with. The avenues and approaches within the body of the building are laid with old flagstones, and the spaces under the seating with wooden blocking. The chancel has a new encaustic tiled pavement by Messrs. Craven, Dunnill, & Co. There are also some new stalls and an ornate pulpit. These are all of English oak, and by Mr. Harry Hems, of Exeter. The body of the church is filled by massive oak seating. These exhibit upwards of 100 bench-ends, all carved with different designs in figure or in foliage. These also have been supplied by Mr. Hems. The builder was the late Mr. A. Restall, of Bisley, near Stroud, who unfortunately died during the progress of the renovation. Mr. Charles E. Ponting, the diocesan surveyor and architect, of Lockeridge, Marlborough, was the architect. Some 3,500*l.* has been spent on the works.

The Student's Column.

ON THE CONSTRUCTION OF ROOFS.

I.

THE roof is in many respects the most important feature of a building, and its design calls forth more of the constructive skill of the architect than any other portion, as the character of the roof regulates to a great degree the strength that is given to the walls which support it. Where the roof is so constructed as to throw a horizontal thrust on the walls, either they must be made of extra thickness or buttresses must be built up against them to prevent them from being overthrown. But where there is no horizontal thrust from the roof we have only to consider what will be its dead weight, and build our supports accordingly.

The object of the roof is to form a waterproof covering that will keep out the weather from the interior of the building. There are several different kinds of material used for the covering of a roof, which is usually laid upon boards or battens nailed upon timbers called *rafters*, to be hereafter described. Roofs are generally inclined at a greater or less angle to the horizontal, in order that the rainwater may be enabled to run off freely into the gutters, and be conveyed away so as not to damage the interior; the angle of slope is called the *pitch* of the roof, and depends very much on the kind of material used for its covering. The materials in common use for this purpose are *lead*, *zinc*, *slates*, *tiles*, and *asphalte*. When either lead, zinc, or asphalte is used the pitch is generally low, but should never be less than 2°, which gives a rise of about 1 in 30. Lead and zinc are, however, frequently laid on roofs of high pitch. When slate or tile is used the angle of pitch should not be less than 27°, giving a rise of 1 in 2.

The best material, but also the most costly for roof-covering, is *lead*, which is laid upon close boarding on which rounded slips of wood, called *rolls*, about 2 in. in diameter have been first nailed from top to bottom in parallel lines 2 ft. to 3 ft. apart. The lead is cut in sheets 10 ft. or 12 ft. long and a few inches wider than the distance between the rolls. It is then laid on the boarding and the edges dressed over the rolls, each sheet lapping over the edge of its neighbour and held down by *lead-headed* nails driven into the rolls. If the pitch of the roof is not very flat, the lower end of the sheet is made to lap about 3 in. over the one below; but in very flat roofs a small step called a *drip* is formed about 2 in. deep at the bottom of the sheet, the end of the lower sheet being turned up against the drip, and that of the upper one turned down so as to lap over it and prevent the rain from driving under the lead. When there is a ridge, a similar roll is spiked to the ridge-piece at the top of the rafters, and a narrow slip of lead is laid thereon and dressed down over the upper edges of the sheets of lead, the ridge being held down by means of lead-headed nails. The weight of the lead for roofing purposes is 6 lb. or 7 lb. to the square foot.

Zinc is a material frequently used for roof-covering, and has the advantage of being very light in weight, 22 oz. to 25 oz. per foot being the weight usually employed. It is laid in a manner similar to that described above for lead, but is a very brittle material and much less durable than lead.

Asphalte can only be used as a roof-covering when the pitch is very low; it may be laid upon flat tiles placed across the rafters, on which a layer of cement is first laid, and the asphalte poured thereon in a semi-fluid state, when the cement is thoroughly hard. Fine sand may be sifted over the surface of the asphalte while soft, so as to increase its hardness. This material forms a good roof for walking upon, for which purpose it is preferable to lead or zinc, but throws a much greater load on the rafters than either of the former.

The most usual material for covering roofs is *slate*, which is cut into various sizes for roofing purposes, those commonly used being 20 in. by 10 in., called "Countess," and 24 in. by 12 in., called "Duchess." Slates of this kind, when used as roofing, weigh from 7 lb. to 9 lb. on every square foot. In laying slates it is usual to nail narrow *battens* or *slate laths* on the rafters, to which the slates are secured by means of copper or zinc nails driven through two holes drilled in each slate about one-third of its length from the top. Each slate laps half its length *plus* 1½ in. or 1½ in. over that next below it, and 2½ in. or 3 in. over the upper end of the next slate but one below it, this amount of 2½ in. or 3 in., being called the *lap* of the slate.

In some parts of the country *stone slates* are used for roofing, and sometimes called *grey slates*; these are really thin *flags* from ¾ in. to 1¼ in. in thickness, and weighing, when laid, about ¼ cwt. to the square foot. They have two holes drilled in them through which pegs of hard wood are driven, and by these they are hung on to the laths.

In buildings of a superior class it is usual before laying the slates, to cover the rafters with close boarding, and lay thereon a waterproof material called "asphalted felt"; this is laid horizontally in continuous lengths, each length lapping 1 in. over the one below. On this the slates can be nailed, or, what is better, the slate laths can be laid on the felt, and the slates nailed upon them in the manner described above. The advantage of the felting is to keep out the heat in summer from the rooms immediately under the roof, as slate becomes very hot in the sun, and is a good conductor of heat. It also keeps the rooms warmer in winter. Another advantage is, that if any slates are blown off, or if snow drifts under them, the felt prevents the wet from penetrating to the interior.

Tiling is a common form of covering to roofs, each tile being generally made with two small hooks on the upper edge, by means of which it is hung on to the laths. There are two distinct kinds of tiles in ordinary use: those called *plain tiles* are made flat, their dimensions being 10½ in. by 6½ in.; these are laid with a *lap* in the same way as slates, and weigh about twice as much per foot. Some tiles have two holes in the upper part to allow of pins being inserted for hanging them on the laths, or for large nails to be driven through. Another form of tile is called *pantile*, which is curved in section, and, when laid, produces a series of ridges and valleys all down the side of the roof, each tile being made to lap over the edge of the one at its side as well as over that next below it. The weight of this tiling is but little more than that of slating. Ornamental tiles of various forms and sizes are also employed for roofing purposes.

The actual weight of the roof-covering is not the only load which the timbers of a roof have to sustain; in fact, it forms but a small part of it, for in northern countries the weight of snow is often a much heavier load, especially where the pitch is not high enough to cause the snow to slide off and prevent it from accumulating. But the chief strain which a roof has to encounter is that produced by the force of the wind when blowing strongly upon one side of it. This is much greater in a roof of high pitch than in one where the pitch is low, for if we consider the direction of the wind to be horizontal and pressing in a gale 40 lb. on every square foot of a surface perpendicular to its direction, then the pressure per foot on a roof having a pitch of 60° will be 30 lb.; on one having a pitch of 45° it will be 20 lb.; and on one of 30 lb. it will be 10 lb.; and, of course, it is nothing on a perfectly horizontal roof. Wind, however, is very capricious in its action, and does not always travel in a horizontal direction, so that at times it might act at right angles to a roof even of very moderate pitch; and, as it presses only on one side of the roof at a time, there is no counterbalancing force on the other side, and a racking strain is consequently thrown upon the timbers. For these reasons it is recommended that a load of 66 lb. per square foot should be taken as the pressure which roofs of ordinary pitch must be expected to bear.

We shall now proceed to consider the means by which the roof-covering is supported, according to the various forms of roof which are adopted.

Flat Roofs.—The simplest mode of constructing a roof is to place horizontal beams across from wall to wall, cover them with boarding, and lay thereon lead, zinc, or asphalte as above described; this plan is often adopted for moderate spans, and where it is desired to make use of the roof for some purpose or other. In the South of Europe and in the East flat roofs are more common than in the Northern countries. Such a roof is constructed in the manner we have previously described for "Floors," and the same scantlings of timber may be employed. For short bearings *single-joists* may be laid across and the boarding nailed on them. For longer bearings *binders* or *girders* should be employed. The timbers must never be laid quite level, but have a fall of at least one in

thirty, so as to allow the rain-water to flow away.

When the roof has to be made fireproof, we can lay rolled iron joists and concrete across the opening, and finish with a coating of cement and asphalte, as we before mentioned when considering fire-proof floors.

In a flat roof the whole of the weight is thrown vertically on the walls, and there is no outward thrust tending to push the walls over, so long as the beams retain their horizontal position. Should, however, the beams be too light for the load they have to carry, they will assume a curved form, as A B D, fig. 1, in which case the roof will act as a wedge to push the walls asunder, with a force R in A C and

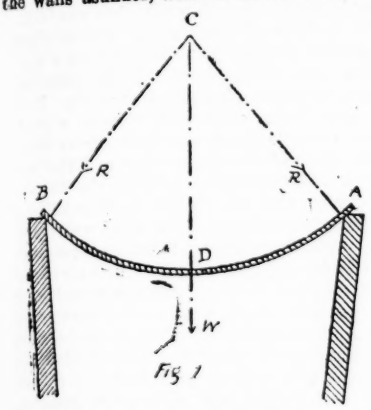


Fig 1

B C perpendicular to the curved beam at A and B, and the value of R is rather more than one-half of W the load on the centre of the roof; C being the centre of curvature of the arc A D B. A very great outward thrust might thus be produced upon the walls at the part where they are least able to withstand it. This shows us the importance of making the supports of a *flat roof* amply strong and stiff, so as not to bend to any appreciable extent under any load that can possibly be placed on the beams.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

294, Improvements in Ornamental Walls, &c. John Baker Gansby, Birmingham.

This invention principally has reference to the construction of ornamental surfaces for ceilings, walls, or pavements. Pieces or plates of glass, enamel, or other ornaments are fixed to the wall or other surface. Supposing a design is composed of several pieces or plates of different coloured enamels, and these pieces are of different shapes to be worked into the design. In order to connect them together, strips of brass or other ductile alloy are taken with a cross section in the form of a T; or narrow strips having something like a similar section may be employed. These metal strips have at their backs at short intervals pins, studs, or projections for the purpose of fixing the design to the wall or ceiling. The working out of the design by means of the strips, and affixing them to wood, plaster, or metal by this means, is the principal claim of the improvements.

7,546, Improvements in Open Fire-grates or Stoves. Samuel Pickersgill, Derby.

In this improvement of open fire-grates the bars at the front are so bevelled inwards as to make it impossible for the ashes either to lodge on or fall through them on to the hearth, but they will be thrown forward into the fire, where they are either consumed or fall to the bottom, which is provided with a secret ash-pan, which may be removed at convenience. By this plan perfect combustion is ensured, and fuel economised. The fireplace is made something similar to the ordinary manner, but the bottom of the fireplace is formed partly of iron bars so constructed as to allow little refuse or ash to fall between them,—and partly of fire-brick. It is attached to the back, which is also of fire-brick, and is so shaped as to radiate and reflect the heat into the room. The form is convenient, and it is claimed that more heat can be got out of the fuel with less smoke than by any other form of open fire-grate.

38, Improvements in Sanitary Traps. William Henman, Birmingham.

This is an improvement in the form of traps for water-closet and for bath, lavatory, sinks, and urinal wastes, by which security is obtained for the inflow of sewer-gas to buildings. The outer arm of the trap is funnel-shaped, and is made with the soil-pipe below, and with the ventilating or air pipe above. The inner arm or arms are placed at about an angle of 45 deg. to receive the connecting-pipe for the water-closets, baths, or urinals. The trap is of any suitable dimensions, and is made of glazed earthenware, stoneware, or of cast iron, or of iron or metal.

APPLICATIONS FOR LETTERS PATENT.

Oct. 17.—13,713, E. Preston, Birmingham, Improvements in Planes, Spokeshaves, and in other analogous Tools or Machines.—13,719, T. W. Helliwell, Halifax, Improved Method of Securing and Fixing to Roofs, Flats, or Sides of Buildings or other Structures, Sheets of Zinc, Copper, Plain, or Corrugated Metal, &c.—13,728, W. Morris, London, Construction and Erection of Bridges.—13,738, J. Carruthers, Carlisle, Shop-window Folding Shutters.—13,750, J. M. Capell, London, Ventilation.—13,761, M. Dennstedt, London, Manufacture and Preservation of Articles of Gypsum, Stucco, or the like.—13,764, R. Davidson and W. H. Wright, London, Immovable Wood Mosaic and Block Flooring, with Pyramidal Dovetail and Fish Joints, and Stain Prevention Chamber.—13,770, T. Elsley, London, Metal Frames for Casement Windows.

Oct. 18.—13,779, J. Walker, Birmingham, Attaching Door Knobs to their Spindles.—13,796, J. Smith, Peebles, Folding Tables, Forms, Chairs, Bedsteads, &c.—13,824, E. Grach, London, Mosaic and other Artistic Work.

Oct. 20.—13,830, T. H. Angles, Blackburn, Water-closet Flushing Apparatus.—13,841, J. Ennals, West Malling, Combination Closet and Dust-bin.—13,845, D. Cowan, Glasgow, Improvements in Cooking-ranges.—13,859, R. Winder, London, Castors for Tables, Chairs, &c.—13,864, A. E. Finch, London, Excluding Draughts from Doors.—13,867, A. J. Boult, London, Manufacture of Paint.—13,871, M. A. L. Ser, London, Fan for Ventilating Purposes.—13,874, G. Henderson and D. M'Neil, London, Water Waste Preventers.—13,878, W. R. Lake, London, Improvements in Bakers' Ovens.

Oct. 21.—13,890, W. Russell, London, Improvements in Stoves, Stove-grates, Mantels, and Overmantels.—13,891, C. J. Elkin, Birmingham, Improvements in Ventilators.—13,907, E. Newman, Birmingham, Window-sash Fastener.—13,909, T. Caink, Malvern, Link Sewer Ventilators.—13,912, C. G. Smith and F. Smith, Birmingham, Rack Action for Opening and Closing Fanlights, Window-Skylights, &c.—13,914, J. James and C. James, Cardiff, Machinery for Sawing or Cutting Wood or other Material.—13,915, P. Rees, Cardiff, Protecting the Edges of Saws and other Tools when not in use.—13,924, A. M. Clark, London, Improvements in Excavators.—13,932, J. C. Mewburn, London, Baking Ovens.—13,943, E. H. Clark, London, Floating Breakwaters.—13,947, W. R. Lake, London, Metallic Lathing.—13,954, W. R. Lake, London, Improvements in Wheels.

Oct. 22.—13,977, F. T. Harrington, Liverpool, Bodies of Wheeled Vehicles.—13,981, A. Yates and W. Smith, Halifax, Adjusting the Table of Circular-Saw Frames.—13,987, R. Eccles, Brixton, Improvements in Castors.—13,990, T. Thorley, London, Chimney-breast Ventilators.—13,991, H. Faija, London, Apparatus for Testing the Strength of Cement.—14,000, A. J. Alderman, Bow, Furniture Castors.—14,004, V. Di Tergolina, London, Underframes for Four-wheeled Vehicles.—14,010, H. J. Cooper, London, Manufacture of Portland Cement.

Oct. 23.—14,056, J. Macdonald, London, Smoke-testing Apparatus.—14,058, S. Guinery, Epsom, Improvements in Locks and Latches.—14,062, P. J. Wates, London, Improvements in Spanners.—14,064, A. Kohlhofer, London, Improved Construction of Domestic Stoves.

PROVISIONAL SPECIFICATIONS ACCEPTED.

10,982, H. V. R. Read, London, Automatically Opening and Shutting Gates.—11,273, M. Underwood, Devonport, a Method of Construction in Metal, Stone, Wood, or other Material, by Dovetailing.—12,615, A. Sweet, London, Improvements in Water-waste Preventers.—12,712, S. Frankenberg, London, Felt for Roofing and other purposes.—12,788, W. W. Crowder, Kennington, Automatic Bolt, Lock, and Burglar-alarm.—12,901, J. Budd, London, Imparting to Glass the Appearance of Marble or other Stone.—12,902, J. Budd, London, Ornamenting or Decorating Glass in imitation of Mosaic or similar work.—12,935, A. M. Clark, London, Improvements in Auger-bits.—13,076, F. W. Primrose and J. Mellowes, London, Supports for Workmen on Glazed Roofs of Building.—13,364, A. A. Joy, London, Improvements in Sash-fasteners.—13,066, H. H. Jones and B. Jones, Wolverhampton, Metallic Folding Furniture.—13,148, W. H. Lindsay, London, Improvements in Bridges.—13,238, R. Hunter, London, Improvements in Kitchen Ranges.—13,381, H. Wright, London, Mounting, Balancing, and Securing Window-sashes.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to opposition for two months.

68, N. G. Kimberley, Tottenham, Steam Pile-driving Apparatus.—144, H. Thompson, London, Construction of Domestic Stoves and Grates.—352, H. Knowles, Woodville, Leicester, Ovens for Burning Bricks, Pottery-ware, &c.—526, J. H. Chavasse, Kingswinford, Improvements in Pavements, Wall Surfaces, &c.—790, G. Homewood, Cuckfield, Water Waste-preventers for Water-closets.—907, C. Clayton, East Dulwich, Finger-plates for Doors, and Means of Fixing the same.—985, A. Walker, Falkirk, Kitchen Ranges.—12,118, R. Booth and R. W. Booth, Dublin, Flooring Clamp.—12,319, G. R. Postlethwaite, Birmingham, Drill Braces.—138, J. Croft, London, Wooden Pavements.—899, F. C. Biddiscombe, Manchester, Cisterns for Water-closets, Urinals, &c.—1,366, E. H. Baxter, Birmingham, Cupboard Fasteners.—3,998, C. J. Henderson, Edinburgh, Construction of Stoves, and Ventilating Apparatus for same.—4,803 S. Morley, Stockton-on-Tees, Whitewashing Brushes.—7,280, G. W. Potter, Hampstead, Door Letter Boxes.—9,450, M. Tobin, Uxbridge, Ventilating Dwellings and other Structures.

RECENT SALES OF PROPERTY.

OCTOBER 24.

By BAKER & SON.

Minories—1 & 4, Vine-street, 17 years, ground-rent 200*l.*	£800
Westbourne Park—36, Fernhead-road, 79 years, ground-rent 6*l.* 10s.	340
Oxford-street—The lease of 27, Rathbone-place, term 18 years	10

OCTOBER 27.

By J. H. GREEN & SON.

Hammersmith—99, Brackenbury-road, 96 years, ground-rent 8*l.*	400

By WESTON & SON.

Peckham—225, Queen's-road, freehold	680
Canning Town—38–46 even, Fisher-street, freehold	1,240

By THOMAS WAKEFIELD.

Barnes—1, 2, & 3, Charlton Cottages, freehold	650
Tottenham—13, Brunswick-road, freehold	530

OCTOBER 28.

By ALFRED RICHARDS.

Stoke Newington—68 & 70, Cowper-road, 74 years, ground-rent 7*l.*	740

By VENTOM, BULL, & COOPER.

Lewisham—44, Limes-grove, 70 years, ground-rent 5*l.*	300

By HORNE, SON, & EVERSFIELD.

Brixton—78-96 even, Barrington-road, 39 years, ground-rent 25*l.*	3,020
Walworth—54, Finchley-road, 66 years, ground-rent 4*l.*	720
237, Hill-street, 66 years, ground-rent 5*l.*	620
146, Lorrimore-road, 66 years, ground-rent 8*l.*, and a ground-rent of 13*l.* a year, term 66 years.	420
Portman Estate—58, Crawford-street, and 19, Homer-street, 4 years, ground-rent 10*l.*	100
59 & 60, Crawford-street, 4 years, ground-rent 11*l.*	365
Paternoster-row—Lovell's-court, 2,680 ft., term 80 years, let at 290*l.* per annum.	

By DRIVER & CO.

Brunswick-square—Improved rents of 50*l.* a year, term 23 years	505

By JOHN REVILL.

Kentish Town—129 & 133, Prince of Wales-road, 67 years, ground-rent 14*l.*	840

By HARDS, VAUGHAN, & JENKINSON.

Lee—50, Church-street, 43 years, ground-rent 2*l.* 2s.	210
Sevenoaks—The freehold residence, Croftside	800

By DEBENHAM, TEWSON, FARMER, & BRIDGEWATER.

Kent, Horns Cross—The residence "Barnsfield," and 2a. 0r. 35p. freehold	2,550
Two freehold cottages, with gardens	710

By PROTHEROE & MORRIS.

Leytonstone—Ground-rent of 7*l.* 10s. a year; reversion in 75 years	165
Ground-rent of 6*l.* a year; reversion, 71 years	120
Leyton—Beaumont-road, a plot of freehold land	160
Milton-road, two plots of freehold land	285

OCTOBER 29.

By FULLER, HORSEY, SONS, & CASSELL.

Fleet-street, Bouverie-street—A plot of freehold land, area 300 ft.	2,130

By BROWN, ROBERTS, & CO.

South Lambeth-road, Nos. 74-84 even, freehold	6,900

By JAMIESON & HANHAM.

Putney—The Platt, Clarence House, 67 years, ground-rent 8*l.* 4s.	540

J. G. & A. PREVOST.

Mile End—37-49 odd, Ernest-street, 80 years, ground-rent 35*l.*	1,060
Nos. 354, 356, & 358, Mile End-road, 35 years, ground-rent 40*l.*	790

FRANK JOLLY & CO.

Mile End—25, 27, & 29, Ernest-street, 80 years, ground-rent 15*l.*	600
Leytonstone—Barclay-road, "Belmont House," 93 years, ground-rent 5*l.*	475

OCTOBER 30.

By C. & H. WHITE.

Brixton—15, Ingleborough-street, 40 years, ground-rent 2*l.*	260
41 & 42, Thornton-street, 40 years, ground-rent 6*l.* 15s.	660

By RICH BROTHERS.

Hove, Brighton—53, Waterloo-street, freehold	1,500
Hackney—Mare-street, "The Old Ship," freehold	1,850
305, Mare-street, and a cottage, freehold	1,500

By NEWBON & HARDING.

Hoxton—14-23, Upper John-street, 15 years, ground-rent 3*l.* 8s.	1,115
Canonbury—20, Clephane-road, 63 years, ground-rent 3*l.*	700
Hackney—2, Bentham-road, 50 years, ground-rent 4*l.*	230
Homerton—53, Holmbrook-street, 43 years, ground-rent 2*l.* 5s.	135
Battersea—Ground-rents of 24*l.* a year; term, 82 years	415
Peckham Rye—Ground-rents of 45*l.* a year; term, 70 years	805
38-44 even, Philip-road, 70 years, ground-rent 15*l.*	1,005

By E. STIMSON.

Bermondsey—Swan Mead, freehold manufacturing premises	1,830
New Cross—11 & 13, Briant-street, 36 years, ground-rent 8*l.*	350

Brixton—48, Josephine-avenue, 81 years, ground-rent 9*l.*	700
52, Stockwell Park-road, 42 years, ground-rent 10*l.*	395
Nunhead Green—46, Tappesfield-road, 92 years, ground-rent 4*l.* 15s.	90
Brixton—23, Josephine-road, 83 years, ground-rent 9*l.*	575

MEETINGS.

SATURDAY, NOVEMBER 1.

Association of Public Sanitary Inspectors.—Monthly Meeting, 1, Adam-street, Adelphi. 6 p.m.

MONDAY, NOVEMBER 3.

Royal Institute of British Architects.—Opening Meeting of the Session. Address by the President. 8 p.m.

Clerks of Works Association.—Monthly Meeting, 31, Spring-gardens. 7 p.m.

TUESDAY, NOVEMBER 4.

Society of Biblical Archæology.—Meeting at 9, Conduit-street, W. The following papers will be read:—(1) Some Religious Texts of the Early Egyptian Period, preserved in Hieratic Papyri in the British Museum, by P. le Page Renouf. (2) Notes on some fragments of Papyri, exhibited by permission of the Secretary of the Science and Art Department, by Dr. Birch. (3) Notes on some Egyptian Sepulchral Tablets, principally of the XVIII. Dynasty, by E. A. Budge. 8 p.m.

WEDNESDAY, NOVEMBER 5.

Institution of Mechanical Engineers.—Meeting in the Lecture Theatre, University College, Nottingham. The following papers will be read and discussed, as far as time will admit:—(1) On the Mineral Wagons of South Wales, by Mr. Alfred Slater, of Gloucester. (2) On the application of Electro-Magnets to the working of Railway Signals and Points, by Mr. Illius A. Timmis, of London. (3) Second report on Friction Experiments, by Mr. Beauchamp Tower, of London.

Shorthand Society (Victoria-chambers, Chancery-lane). Opening Meeting of the Session. Address by the President, Mr. Thomas Allen Reed. 8 p.m.

THURSDAY, NOVEMBER 6.

Builders' Benevolent Institution.—Thirty-seventh Anniversary Dinner, at the Freemasons' Tavern, Mr. Stanley G. Bird, President, in the chair. 5.30 p.m.

FRIDAY, NOVEMBER 7.

Architectural Association.—Mr. J. D. Sedding on "The Modern Architect and his Art." 7.30 p.m.

Miscellanea.

Cambridge Antiquarian Society.—At a general meeting of this society on the 20th of October, Mr. J. W. Clark, M.A. (president), in the chair, Mr. A. G. Wright, of Newmarket, exhibited (1878) a Roman bronze earring and a Mediæval bronze signet-ring, both found at Stony Hall, Lakenheath, early in this present year; also a photograph of a rare palæolithic implement from New Park, March. Mr. Lewis exhibited a well-preserved first brass of Marcus Aurelius, *rev.* HONOS, with portrait of the Emperor erect, olive-branch and cornucopiæ (141 A.D.), which had been found in 1883 at Litlington, in this county. Mr. Browne exhibited an outlined rubbing of the Wilne font, a very intricate and elaborate piece of Early work, with twelve bold characters round the base, supposed to be Runic or Oriental, and in the latter case probably Palmyrene. The font is a portion of what must have been a very remarkable column, turned upside down, and when the rubbing is turned the other way up it is found that the twelve bold characters are the feet and ankles of six human figures, cut off at the point where the pillar was broken before it was turned up and hollowed to form a font.

Election of a Surveyor.—At a meeting of the Chelsea Vestry on the 21st ult., the Finance Committee reported that they had considered the eighty-two applicants for the post, and out of the number selected, six, who were now in attendance, and each, in his turn, addressed the Vestry, and answered the questions put to him. The Vestry then proceeded to a ballot, the result being the election of Mr. Strachan, by a large majority. Fifty vestrymen voted, and of these the papers of four were declared informal. A corresponding clerk was also elected.

Proposed New Post-office at South Shields.—The Post-office authorities have decided upon building a new post-office at South Shields. The step has been decided upon in consequence of the present building being inadequate to meet the requirements of the largely-increasing business in the various departments. The new post-office will be designed on a large scale, and will contain ample accommodation for the public and officials.

The Clock at Great Houghton Church.—The church at Great Houghton has just been enriched by having a large new clock fixed in the tower, which strikes the hours on a large bell, and shows the time on two dials, each 4 ft. diameter. Messrs. John Smith & Sons, Midland Clock Works, Derby, have carried out the work.

Glasgow Institute of Architects.—At the annual meeting of the Glasgow Institute of Architects, the sixteenth report of the Council was read. It was mentioned that the draft of a proposed Building Act, separate from the Police Bill, having been drawn up and submitted by the president, a committee was appointed as to the matter. After various discussions the draft was printed, and a copy sent to each member of the Council. At several meetings of the Council the draft was gone over and revised, after which a printed copy was sent to all members of the Institute. Thereafter the draft Act was considered and adopted at a meeting of the Institute, and Messrs. James Thomson, president, Campbell Douglas, and John Honeyman, past-presidents, were appointed a deputation to wait on the Lord-Advocate and confer with him on the subject. It was agreed that while a separate Building Act would be most desirable, yet if absolutely necessary, rather than have delay they should agree to the Building Act forming part of the proposed Burgh Police and Improvement (Scotland) Act. The Burgh Police and Improvement (Scotland) Act having in the previous session of Parliament failed to pass the House of Commons, a new Bill was brought in by the Lord-Advocate in the course of last session. This Bill was found to be, so far as the architectural and other kindred clauses were concerned, substantially a reprint of the former Bill, no effect having been given to the suggestions of the Institute. The Bill was referred to a Select Committee of the House of Commons, and it was ascertained that the only way in which the members of the Institute might now have effect given to the suggestions was to forward a written statement of these to the members of the committee. A copy of the draft prepared by the Institute was accordingly forwarded to several members of the committee, but, owing to the Bill having been dropped by the Government, no legislation has yet taken place. The committee have given much attention to the examinations in architecture held in Glasgow in February, under the auspices of the Royal Institute of British Architects. The Council and the past-presidents were appointed a committee to take charge of the examination. In this they were assisted by Mr. Arthur Cates, chairman of the Board of Examiners, and Mr. J. Macvicar Anderson, honorary secretary of the Royal Institute of British Architects. The Council think that these examinations will prove very beneficial to the profession, and hope that a larger number will come forward when the next examination is held.

Removal of Gates and Bars in the Metropolis.—On the 16th ult. the Sanitary Committee of the Vestry of St. James, Westminster, recommended that the Vestry support the memorial adopted by a conference of representatives from various local authorities, recently held at St. Pancras, asking the Metropolitan Board of Works to introduce a Bill in the ensuing session of Parliament, for the removal of all gates, bars, &c., from the streets where the cost of paving and lighting, maintaining, and sewering such streets is defrayed out of the rates. Mr. Bonthron vigorously opposed the proposition that the ratepayers should give compensation. Let the ground landlords do it. By what natural right had these landlords put up bars and gates? He denied their right to block up the public thoroughfares on their estates. He did not deny that the tenants were entitled to compensation; but let them get it from the landlords who had put up the gates. The Vestries should act all together in this matter, for what affected one part of London affected every other part. The motion to adopt the recommendation was carried with only a few dissentients.

Pontefract Drainage Scheme and Street Improvements.—The Corporation of Pontefract have just completed the whole of the drainage scheme, extending throughout the borough, at a cost of about 20,000*l.* The works have been carried out by the contractor, Mr. John Simpson, of Hunslet, Leeds. The outfall works are situate about two miles from the town.

Hydraulic Power. — Messrs. Archibald Smith & Stevens, of Queen's-road, Battersea, have just completed a new hydraulic cylinder and crane for Southwark Wharf, Bankside. This forms another set of machinery worked in connexion with the Hydraulic Power Company's mains.

"Buried" in a Caisson. — An accident, singular in its character and most remarkable in the escape of those involved in it, is reported from Havre de Grace, Maryland. The Baltimore and Ohio Railroad Company are constructing a new bridge over the Susquehanna river, and on October 1 the outer shell or cofferdam of the caisson sunk as the foundation for one of the piers gave way. The crib and air-lock shaft were flooded, and the working chamber rapidly filled. Most of the men got out safely before the accident occurred, but six men were imprisoned in the submarine chamber. The caisson in question is larger than any of the others sunk for the bridge. It is 60 ft. long and 40 ft. wide, and at the time of the accident the working chamber was 60 ft. below the surface of the water. The entrance to the caisson proper is made through a perpendicular iron shaft about 3 ft. in diameter, with foot and hand holes on either side. It is divided into locks, each lock having a gate. When the men descend, the lock tender withdraws the air and the gate falls, and the last man down lifts the gate. When the bottom gate is opened, the air rushes in, thus holding the top gate in position. The same process is repeated until the working chamber is reached, which is lighted by electricity. The air in the chamber, beyond being a little oppressive, is said to be not unpleasant. The men were working under a pressure of 28 lb. at the time of the collapse, and when the lock flooded, the only entrance or exit to and from the caisson was cut off. The air apparatus, however, fortunately continued at work, and this was the men's salvation. They remained in their prison helpless until rescued by the superintendent, Mr. John O'Brien, who conceived an ingenious plan, and proceeded to put it into practice. The outer lock was 5 ft. under water, and the next lock, which was 15 ft. deep, was full of water. Mr. O'Brien made a cofferdam of boards, and caulked it tightly with oakum and cement. Then he baled out the water, descended, and raised the flooded lock, and baled that out. He then descended through his rudely-constructed shaft, and successfully rescued the six men from their perilous situation, in which they had been for five hours. The operations were naturally watched with the greatest anxiety.—*Iron.*

Proposed Ferry at Greenwich.—At the meeting of the Lewisham Board of Works, on the 22nd ult., Mr. Hughes said it had been decided to have a ferry from Greenwich to the other side of the river. The original proposal was a ferry from Horseferry-road to Greenwich; but he pointed out that that would compel people to go through back streets, and that inasmuch as the Metropolitan Board would have to compensate the proprietors of the existing ferry, it would be as well to have their premises. The committee agreed to recommend the acquirement of the premises.

The Tay Bridge.—It is stated that important negotiations are in progress between the directors of the North British Railway Company and the city of Perth, with the view of very considerably reducing the height of the Tay Bridge. It is understood that the height proposed in the negotiations is 55 ft. at the highest part of the bridge, and that the sum to be paid to the City of Perth by the North British Railway Company in return for the concession would be upwards of 90,000*l.* No alteration in the height of the bridge can be made without the sanction of Parliament.

Completion of the Esk Viaduct.—The Esk Viaduct, which carries the new line of the Scarborough and Whitby Railway over the river Esk, is now practically completed, and on the 24th ult. a large party was conveyed across it for the first time, in the presence of a crowd of people. The viaduct, which is constructed of red brick, is 913 ft. long and 125 ft. high, with twelve piers and thirteen arches of an average span of 60 ft. The viaduct is the last link needed to connect Middlesbrough and the teeming population of Cleveland with Scarborough.

Strike of Riveters on the Clyde.—The riveters of Messrs. Robert Napier & Sons, Govan, have struck work for higher rates of wages. Owing to the depressed condition of trade on the river, the strike is engaging a good deal of attention in shipbuilding circles, while its latest development,—namely, the employment of non-unionists,—seems to have created a bad feeling amongst the operatives more immediately interested in the event.

New South Wales Marble.—According to the Immigration Agent for New South Wales, several beds of very fine marble or crystalline limestone occur in different parts of the Colony, as at Wollondilly, whence one of the marbles, used in paving the great hall of the University, the Post-office, and other public buildings in Sydney, has been obtained. Much of the Wollondilly so-called "white marble" is of a creamy tint, variegated with pale red and light blue streaks. A slate-coloured marble, used in the same buildings, is brought from Marulan, near Goulburn. There is a beautiful white saccharoid marble at Cow Flat, near Bathurst, a brecciated slate-coloured marble streaked with white calcite occurs at Wallerawang, county Cook. Beautiful marbles occur at Mudgee and Orange; also at Wellington, celebrated for its caves. At Bangalore, on the Goulbourn Plains, there is found a white crystalline marble; at Yass and Queanbeyan, county Murray; good grey and white crystalline marbles are found along the banks of the Murrumbidgee; the Belubula River and the Conomodine Creek, in the Orange District. Blue-grey limestone at Warialda, county Burnett. The outcrops of small seams of grey crystalline limestone or marble are seen exposed in the Minumurra Creek, near Jamberoo, county Camden, interbedded with the coal, shale, and sandstones of that district. A specimen from a 2-in. band in the Minumurra Creek was slightly crystalline, of a grey colour, with a few thin streaks of a lighter colour. Small patches of a pale green mineral were detected in parts, something like glauconite in appearance.

Arbroath.—Two more three-light Munich windows have been erected in St. Mary's Church, Arbroath; one by subscription, in memory of the late Rev. W. Henderson, fifty-one years pastor, and representing the "Good Samaritan," the other by Dr. J. Traill, in memory of his brother and his son, and representing "Christ Healing the Sick." The artists were Messrs. Mayer & Co.

Scarcity of Water in Manchester.—Manchester is threatened with a water famine, the continuous dry weather having so reduced the stock that four of the great reservoirs are quite dry, cattle grazing on ground formerly covered with water. The gathering-ground is 19,000 acres of moorland around the Longdendale Valley, between Manchester and Sheffield, and the supply is distributed not to Manchester only, but to Salford and the surrounding districts, so that a total population of 750,000 is involved. Mills, dyeworks, and other industries will be stopped unless there be rain. Thirlmere, which the Manchester Corporation obtained Parliamentary powers to purchase, is not yet available for water supply, and will not be for years. Inquiries made on Saturday, however, showed that the danger is not now so great as it was a month ago. The report then made was that there was sufficient water in the reservoirs to meet only thirty days' consumption; and upon this being made known to the committee, they ordered that watering of the streets should cease, and that the use in the parks should be restricted. It is believed that but for the fact that the Gorton reservoir allowed the storage of what would have run to waste at Longdendale, there would have been a famine ere now.

The New Liberal Clubhouse in Northumberland-avenue.—Immediately opposite to the Hotel Metropole in Northumberland-avenue, the new building for the National Liberal Club is to be erected, of which Mr. Gladstone and Earl Derby are to lay the first stone on November 4th. Mr. Waterhouse is the architect.

Staple Inn, Holborn.—*Truth* says that the "ancients" of Staple Inn have recently completed the sale of their property to Messrs. Trollope, the well-known builders, for 80,000*l*. If there be any truth in the rumour all lovers of the picturesque must hope that the quaint old houses and gateway at Holborn Bars are not to be removed.

COMPETITIONS AND CONTRACTS.

Epitome of Advertisements in this Number.

COMPETITIONS.

Nature of Work.	By whom required.	Premium.	Designs to be delivered.	Page.
Wrought-Iron Bridge	Swindon New Twn. L. B.	25*l*.	Dec. 1st	i.

CONTRACTS.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Outfall Sewers	Frome Local Board	P. Edinger	Nov. 3rd	ii.
Beech Wedges	Admiralty	*Official*	Nov. 4th	i.
Cast-Iron Work	Commissnrs of Sewers	do.	do.	ii.
Chocolate Cases	Admiralty	do.	Nov. 6th	i.
Broken Granite	Walthamstow Lcl. Bd.	do.	do.	xx.
Stone Paving	Dartford Local Board	do.	Nov. 7th	ii.
Broken Granite	do.	do.	do.	ii.
Alterations and Additions to Queen's Hotel, Leeds	Midland Railway Co.	A. A. Langley, C.E.	do.	ii.
Well Boring	Southampton Corporatn	*Official*	Nov. 8th	ii.
New Post-office, Bradford	Commissnrs. of Works	do.	Nov. 10th	ii.
Bridge on Filsham Estate	Owners	Elworthy & Son	do.	xx.
Sewerage and Paving	Belfast Town Council	J. C. Bretland	Nov. 11th	ii.
Paving Works	Greenwich Bd. of Wks.	*Official*	Nov. 12th	xx.
Road Making and Paving	Fulham Board of Wrks	do.	do.	ii.
Erection of Retort House	Isle of Thanet Gas Co.	H. E. Jones, C.E.	Nov. 13th	ii.
Road Making, New Windsor		T. V. H. Davison, C.E.	Nov. 15th	ii.
Factory, Vauxhall	Barrett's Bottling Co.	E. Rawlings	Postponed to Nov. 17th	i.
Construction of Embankment	Rochester Corporation	W. Banks	do.	xx.
Works and Repairs (Hampton Court, Kew, and Richmond District)	Commissionrs of Works	*Official*	Nov. 24th	ii.
Construction of Sewers	Met. Board of Works	*Official*	Nov. 28th	i.
Main Drainage Works	Acton Local Board	do.	Dec. 2nd	ii.
Heating Apparatus	"Invicta" Club	.....	Not stated	xx.

TENDERS.

For new workhouse at Mitcham, for the Guardians of the Poor of the Holborn Union, to accommodate 1,000 inmates, and with administrative offices for 1,200 inmates. Messrs. H. Saxon Snell & Son, architects, 22, Southampton Buildings, London:—

Nightingale	£64,636 0 0
Kirk & Randall, Woolwich	64,034 0 0
Gabbutt, Liverpool	61,495 0 0
Adcock, Dover	60,753 0 0
Mowlem & Co.	59,750 0 0
Peto Bros.	58,696 0 0
Howell & Sons	57,495 0 0
Wall Bros. (accepted)	57,461 0 0

Accepted for projected sewer work in Bath-street and King-street, for the St. Luke's Vestry:—

Bath-street.

C. Killingback	£490 0 0

King-street.

C. Killingback	75 0 0

For the erection of premises at Limehouse, for the London and County Banking Company. Mr. Zeph King, architect:—

Rider & Son	£8,158 0 0
Higgs & Hill	7,884 0 0
J. H. Johnson	7,880 0 0
W. Shurmur	7,488 0 0
A. Bush	7,320 0 0
Holloway Bros.	7,298 0 0
T. Boyce	7,275 0 0
Perry & Co.	7,220 0 0
W. Bangs	6,983 0 0
J. Morter	6,967 0 0

For alterations and additions at the Swan Hotel, Woburn Sands. Messrs. Usher & Anthony, architects. Quantities supplied:—

E. George, Woburn Sands	£699 0 0
G. Harrison, Bedford	698 0 0
S. Foster, Bedford	695 0 0
J. P. White, Bedford	677 0 0
W. Sharrett, Woburn Sands	500 0 0

For building Sexey's County School, at Doulting, Shepton Mallet, Somerset, for the Visitors of Hugh Sexey's Hospital, Bruton. Mr. George J. Skipper, architect, Opie-street, Norwich. Quantities by the architect:—

Jones & Co.	£13,713 0 0
Clarke	13,359 0 0
Gibson	13,131 0 0
Sanders	12,439 0 0
Stephens & Bastow	12,300 0 0
Clarke & Son	12,046 0 0
Davis	11,980 0 0
Green	11,980 0 0
Bull & Co.	11,796 0 0
Krauss	11,517 0 0
Hawkins	10,904 0 0
Emery, Shepton Mallet (accepted)	10,600 0 0

For the enlargement of school, Portman-place, Globe-road, for the London School Board. Mr. E. R. Robson, architect:—

F. & F. J. Wood	£8,727 0 0
J. F. Sargeant	8,186 0 0
Steel Bros.	7,949 0 0
W. Shurmur	7,758 0 0
J. R. Hunt	7,695 0 0
Perry & Co.	7,633 0 0
E. C. Howell & Son	7,480 0 0
Atherton & Latta	7,450 0 0
J. Grover	7,445 0 0
W. Scrivener	7,445 0 0
J. Pritchard	7,345 0 0
T. Oldrey	7,200 0 0
C. Cox	7,158 0 0
S. J. Jerrard	7,149 0 0
Stimpson & Co.	7,086 0 0

For the erection of club house, Park Butts, Kidderminster, for Mr. D. W. Goodwin. Mr. J. M. Gething, architect, Kidderminster:—

Binnian & Son	£2,075 0 0
Howard & Sons	2,009 0 0
C. A. Horton	1,955 0 0
R. Thompson	1,945 0 0
H. Smith	1,9 0 0 0
Hilton & Sons	1,900 0 0
W. T. Bennett	1,867 0 0
Bradney & Co.	1,799 0 0
Jno. Guest	1,775 0 0
Dorse & Son	1,728 0 0
J. H. Bate (accepted)	1,630 0 0

For house at Skipton, for Mr. George Robinson (exclusive of stable and coachhouse). Mr. F. J. Robinson, architect, Derby. Quantities by Mr. J. E. Smith:—

Lewis & Son, Great Harwood	£3,340 0 0
Haworth & Roberts, Skipton	3,292 0 0
Armitage & Hodson, Leeds	3,218 0 0
Wm. Clegg, Accrington	3,216 0 0
Abbott & Son, Blackburn	3,200 0 0
H. Brassington, Settle	3,109 0 0
Wm. Foster, Bingley (accepted)	3,050 0 0

For the erection of a public hall, museum, and literary institute at Street, near Glastonbury, Somerset, for Mr. William S. Clarke, Greenbank-street. Mr. George J. Skipper, architect, Opie-street, Norwich. Quantities by the architect:—

Merrick	£3,797 0 0
Pollard	3,753 0 0
Hawkins, Glastonbury (accepted)	3,675 0 0

Accepted for the erection of a school to provide accommodation for 1,000 children, on the site in Queen's Head-street, Finsbury:—

J. R. Hunt, St. Paul's Works, Bow Common*	£12,389 0 0

* Subject to the assent of the Education Department of the School Board.

For barracks, Runcorn. Mr. E. J. Sherwood, architect, No. 101, Queen Victoria-street, London:—

H. White, Runcorn	£2,300 0 0
J. Wilson, Runcorn	2,150 0 0
Stelfox & Carter, Northwich	1,934 17 5
J. Littler, Fir Bank, Frodsham	1,925 0 0
Wm. Holt, Cheetham, Manchester	1,833 0 0

[Architect's estimate, 1,811*l*.]

For building stable and washhouse in Sherwood Rise, First Avenue, for Mr. Charles Hibbert. Mr. Charles Wright, architect. Quantities supplied:—

H. Lane, Park-street	£463 0 0
Baines & Turton	443 0 0
H. Vickers	423 0 0
G. Smith	414 0 0
Taylor & Chester	399 0 0
E. Hind	398 0 0

For the erection of Masonic Hall at Barmouth, for Mr. Samuel Pope, Q.C. Mr. Thomas Roberts, Assoc.-M. Inst. C.E., architect:—

Jones, Arthog	£1,300 0 0
Jones & Lloyd, Portmadoc and Criccieth	1,190 0 0
Jones & Edward, Barmouth	1,180 0 0
Jones Portmadoc	1,135 0 0
Roberts & Evans, Portmadoc and Harlech	1,047 0 0
Hughes, Portmadoc	1,017 0 0
Thomas, Parry, & Co., Llanbedr	931 0 0
Jones, Thomas, & Williams,* Barmouth	921 0 10
Owens, Barmouth	912 0 0
Davies, Barmouth	847 0 0
Roberts & Williams, Talsarnan and Harlech	840 9 2

* Accepted subject to a slight modification.

For the erection of model dwellings at Limehouse. Mr. Walter Stair, architect:—

J. W. Bolding (accepted)	£4,300 0 0

For the erection of villa at Chingford, Essex. Mr. Walter Stair, architect:—

Barkel	£536 0 0
Cushen	485 0 0
Freeman	450 0 0

For building new schools at Edward-street, for the School Board for London. Mr. E. R. Robson, architect:—

Hobbs	£11,400	0	0
Turtle & Co.	11,094	0	0
Grover	10,567	0	0
Cox	10,556	0	0
Stimpson & Co.	10,535	0	0
Scrivener & Co.	10,520	0	0
Downs	10,484	0	0
Wall Bros.	10,462	0	0
Atherton & Latta	10,400	0	0
Bangs	10,340	0	0
C. Wall	10,330	0	0
Hart	10,300	0	0
Lathey Bros.	10,232	0	0
W. Johnson	10,182	0	0
Kirk & Randall	10,114	0	0
Jerrard	10,039	0	0
Wm. Oldrey	10,000	0	0
Holloway	9,861	0	0

For building new schools at Settles-street, for the London School Board. Mr. E. R. Robson, architect:—

Holloway Bros.	£8,676	0	0
T. & T. J. Wood	8,514	0	0
N. & F. Croaker	8,482	0	0
W. Goodman	8,473	0	0
J. Outhwaite & Son	8,466	0	0
H. L. Holloway	8,447	0	0
Stimpson & Co.	8,440	0	0
J. Grover	8,380	0	0
Howell & Son	8,376	0	0
Lathey Bros.	8,375	0	0
Bangs & Co.	8,300	0	0
Steel Bros.	8,285	0	0
W. Shurmur	8,271	0	0
Wall Bros.	8,266	0	0
Chas. Cox	8,240	0	0
Kirk & Randall	8,115	0	0
W. Oldrey	8,100	0	0
S. J. Jerrard	8,069	0	0
W. Johnson	8,034	0	0
Atherton & Latta	7,995	0	0

For building a new villa residence at Kilburn, for Mr. T. Brocke. Mr. W. C. Styche, architect:—

Hudson	£3,340	0	0
Writer & Sons	2,868	0	0
H. B. Oldrey	2,840	0	0
Dentin	2,795	0	0
Watson	2,787	0	0
W. Oldrey	2,600	0	0
Harris	2,553	0	0
W. J. Taylor	2,444	0	0

Accepted for second-hand paving works and relay of old materials, for the Vestry of St. Luke:—

Mowlem & Co.	£1,933	0	0

And 4s. per yard respectively.

For mason's work in connexion with the Bedminster Pleasure-grounds, Bristol:—

Yalland	£1,041	0	0
Howell & Son	1,008	0	0
T. Hatherly	980	0	0
Cryer	864	0	0
Osborne	842	0	0
Church	794	0	0
Rossiter	785	0	0
A. Krauss	737	0	0
H. Rossiter (accepted)	640	0	0

For works at the open space, Newfoundland-road, Bristol:—

Howell & Son	£589	0	0
Yalland	499	0	0
Osborne	479	0	0
Williams & Prosser	450	0	0
J. Cryer	430	0	0
Hatherly	427	0	0
Church	399	0	0
A. Krauss	373	0	0
H. J. Rossiter (accepted)	320	0	0

For the construction of roads, with kerbed path and surface-water drainage, on the Luton-road Estate of the National Liberal Land Company, Limited, Chatham. Mr. George Pooley, surveyor, 26, Charing-cross:—

S. Chafen, Rotherhithe	£875	0	0
W. Nicholls, Wood-green	875	0	0
J. C. Trueman, South Hackney	865	0	0
W. Carter, Anerley	842	0	0
Thos. Adams, Tower-chamber, Moorgate-street (accepted conditionally).	747	0	0

For new road and sewer upon the Britannia Park Estate, Hampstead. Messrs. Farebrother, Ellis, Clark, & Co., surveyors:—

Watts	£2,379	0	0
Eli Wilson	2,300	0	0
Bell	2,297	0	0
A. & F. Culverhouse	3,270	0	0
Killingback	2,269	0	0
Nowell & Robson	2,250	0	0
Rogers & Dickens	2,233	0	0

For alterations to the Town-hall Tavern, Hammersmith, for Messrs. Acton, Phillips, & Son. Mr. H. I. Newton, architect, 17, Queen Anne's-gate:—

Steel Bros.	£650	0	0
Warne	579	0	0
Lamble	565	0	0
Cook	525	0	0
Walker (accepted)	449	0	0

For repairs and sanitary works to six houses at Dorville-road, Lee, Kent, for Mr. J. Sherwood. Messrs. Wigg & Oliver, architects:—

Hersee	£1,790	0	0
Little	1,573	0	0
Sargent	1,250	0	0
Saunders	1,196	0	0
White	1,189	0	0
Exton	1,180	0	0

For new fittings at the Black Dog public-house, Shoe-lane, Fleet-street, for Mr. Taunton. Mr. H. I. Newton, architect, 17, Queen Anne's-gate, Westminster:—

Heath	£122	0	0
Warne	102	0	0
Hellings (accepted)	99	18	0

For stables, coachhouse, and dwelling-house in rear of No. 116, Brompton-road. Mr. Richard H. Hill, architect:—

Perry & Co.	£1,370	0	0
A. Bailey	1,359	0	0
J. Morter	1,275	0	0
Bangs & Co.	1,220	0	0
W. Gregar	1,184	0	0
Harris & Wardrop	1,180	0	0
Oswald Craske (accepted)	1,153	0	0
J. Holland	1,123	0	0

For the erection of new show-room for Mr. Simmonds, Rye lane, Peckham. Mr. William Barnes, architect, 26, Choumert-grove, Peckham:—

Hardiman & Watts (accepted)	£147	0	0

Special Notice.—Lists of tenders frequently reach us too late for insertion. They should be delivered at our office, 46, Catherine-street, Strand, W.C., not later than four p.m. on Thursdays.

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"THE BUILDER" is supplied DIRECT from the Office to residents in any part of the United Kingdom at the rate of 19s. per annum, PREPAID. To countries within the Postal Union, 26s. per annum. Remittances payable to DOUGLAS FOURDRINIER, Publisher No. 46, Catherine-street, W.C

TO CORRESPONDENTS.

J. A. G.—A. B. J.—H. F.—W. C. T.—W. H. T.—W. G. C.—F. L.—S. B. G. (next week).—R. R.—F. W. R.—W. B. W. & Co. (it is not our business to make such an announcement. It can be inserted in our advertising columns on the usual terms).—E. B. (no space).

All statements of facts lists of tenders, &c., must be accompanied by the name and address of the sender, not necessarily for publication.

We are compelled to decline pointing out books and giving addresses.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

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Letters or communications (beyond mere news-items) which have been duplicated for other journals, are NOT DESIRED.

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